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QUARRY BLUFF DEVELOPMENT, LLC
CONDITIONAL USE PERMIT APPLICATION

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DOOR COUNTY LAND USE SERVICES
421 Nebraska Street – Door County Government Center
Sturgeon Bay, Wisconsin 54235
(920) 746-2323 - FAX (920) 746-2387

APPLICATION FOR CONDITIONAL USE PERMIT

TO THE ZONING ADMINISTRATOR. The undersigned hereby makes application for a CONDITIONAL USE PERMIT for the work described and located as shown herein. The undersigned agrees that all work shall be done in accordance with the requirements of the Door County Comprehensive Zoning Ordinance.

1. OWNER NAME AND MAILING ADDRESS

Name MARGARET DREUTZER
No. 4883 Street HARDER HILL RD
City STURGEON BAY State WI Zip 54235
Home Phone # — - ____ - ____
Daytime Phone # ____ - ____ - ____
Email: TOM.JOE12@GMAIL.COM

2. BUILDING SITE LOCATION

Fire # ____ Road CTY HWY B
Town of SEVASTOPOL
Local Phone # — - ____ - ____

3. DEVELOPER NAME AND MAILING ADDRESS

Name QUARRY BLUFF, LLC
No. PO. 54 Street ____
City FISH CREEK State WI Zip 54212
Phone # 920 - 421 - 5200 ____
Email: TOM.JOE12@GMAIL.COM

4. PROPERTY IDENTIFICATION

Parcel No. ____ - ____ - (SEE ATTACHED)

5. USE

Proposed use of land or structure:
(SEE ATTACHED)

6. SANITARY PERMIT

Type of System HOLDING TANK
Sanitary Permit No. APPLIED FOR
Date of Issuance ____
Approximate date of installation ____

7. BUILDING PLANS AND SITE PLAN

TO SCALE BUILDING PLAN AND SITE PLAN REQUIRED. IF PLANS EXCEED AN 11" X 17" FORMAT, SUBMIT ONE COPY OF EACH SHEET REDUCED TO 11" X 17". (SEE ATTACHED)

8. ROCKHOLES

A rockhole is any depression or opening in the ground surface through which gathered surface water enters bedrock and eventually joins groundwater.

To the best of your knowledge, do any rockholes exist on the lot?

X No ____ Yes

If yes, show location on Site Plan.

9. FEE $500.00

Make check payable to the Door County Treasurer.

10. AUTHORIZATION FOR INSPECTION

I hereby authorize the Zoning Administrator(s) to enter and remain in or on the premises for which this application is made at any reasonable time for all purposes of inspection relative to this petition.

11. SIGNATURE OF APPLICANT OR AGENT

Michael J. Parent
Date DEC 2, 2019

Receipt No. ____ *Fee* ____ *Date* ____
Date Permit Issued: ____
Certificate of Compliance: Date ____

Shoreland Zoning Yes / No ***(FOR OFFICE USE ONLY)***
Zoning District ____

Inspections:

Date ***Inspector*** ***Remarks***

Permit Issued: (by) ____ ***(date)*** ____ ***(for)*** ____

(w/conditions) ____

Permit Denied (by) ____ ***(date)*** ____ ***for the following reasons:*** ____

APPLICATION FOR CONDITIONAL USE PERMIT – ADDENDUM

A conditional use permit applicant has the burden of proof. S/he must demonstrate that the application and all requirements and conditions established by the Resource Planning Committee relating to the conditional use are or shall be satisfied, all of which must be supported by substantial evidence. "Substantial evidence" means facts and information, other than merely personal preferences or speculation, directly pertaining to the requirements and conditions an applicant must meet to obtain a conditional use permit and that reasonable persons would accept in support of a conclusion.

If an applicant meets this burden of proof, the Resource Planning Committee will grant the conditional use permit. If an applicant fails to meet this burden of proof, the conditional use permit application will be denied.

To aid in its review of the proposed project, the Committee will consider the Door County Comprehensive Zoning Ordinance criteria set forth below. Answer all portions of all questions completely. State "not applicable," if appropriate, offering an explanation as to why facts and information were not provided.

Please provide the Resource Planning Committee members substantial evidence regarding:

1) Whether the proposed project will adversely affect property values in the area.

SEE ATTACHED

2) Whether the proposed use is similar to other uses in the area.

SEE ATTACHED

3) Whether the proposed project is consistent with the Door County Comprehensive and Farmland Preservation Plan or any officially adopted town plan.

SEE ATTACHED

4) Provision of an approved sanitary waste disposal system. SEE ATTACHED

____ Public Sewer

_____ Private Onsite Wastewater Treatment System (POWTS)

Check One
____ Existing
____ New

Check One
____ Conventional Septic
____ Other In-ground System
____ Holding Tank

5) Provision for a potable water supply. SEE ATTACHED

____ Public Water Supply
(Liberty Grove Sanitary District #1 and Maplewood only)

_____ Well

Check One
____ Existing
____ New

Check One
____ Private Well
____ Shared Well

6) Provisions for solid waste disposal. SEE ATTACHED

____ Commercial hauler
____ Private delivery to collection site
____ Other _____

7) Whether the proposed use creates noise, odor, or dust.

Noise: SEE ATTACHED

Odor: SEE ATTACHED

Dust: SEE ATTACHED

CONDITIONAL USE PERMIT ADDENDUM – PAGE 2

8) Provision of safe vehicular and pedestrian access. SEE ATTACHED

Vehicular Access

____ Existing Driveway(s) to _____.
(Road Name)

____ New Driveway(s) to _____.
(Road Name)

Pedestrian Access SEE ATTACHED

____ Sidewalks

____ Path or Trail

____ No Pedestrian Traffic

9) Whether the proposed project adversely impacts neighborhood traffic flow and congestion.

Existing traffic: _____High Levels ____ Medium Levels _____ Low Levels

SEE ATTACHED

10) Adequacy of emergency services and their ability to service the site.

Take this form to the local Fire Chief with a copy of the plans for review. Have Fire Chief complete and sign below.

As Fire Chief of the Sturgeon Bay Fire Department, I have reviewed the plans of this project. Our Department (**can / cannot**) access this site for fire protection purposes.

Other Fire Chief comments: SEE ATTACHED

_____, Fire Chief 12-4-19
(Signature) (Date)

11) Provision for proper surface water drainage. SEE ATTACHED

____ Natural Infiltration (explain below)

____ Some Grading of the Site (explain below)

____ Engineered Stormwater and/or Erosion Control Plan (attach)

12) Whether proposed buildings contribute to visual harmony with existing buildings in the neighborhood, particularly as related to scale and design.

SEE ATTACHED

CONDITIONAL USE PERMIT ADDENDUM – PAGE 3

13) Whether the proposed project creates excessive exterior lighting glare or spillover onto neighboring properties.

SEE ATTACHED

14) Whether the proposed project leads to a major change in the natural character of the area through the removal of natural vegetation or alteration of the topography.

Natural Vegetation: ____ No Removal
____ Some Removal
____ Significant Removal (provide Landscape Plan)

SEE ATTACHED

Topography: ____ No Change
____ Some Change
____ Major Change (provide Grading Plan)

SEE ATTACHED

15) Whether, and in what amount and form, financial assurance is necessary to meet the objectives of this ordinance.

SEE ATTACHED

16) Whether, and to what extent, site-specific conditions should be imposed to mitigate potentially problematic impacts of the use.

SEE ATTACHED

17) The impact of the proposed project on public health, public safety, or the general welfare of the County.

SEE ATTACHED

The Resource Planning Committee will establish a completion date for the proposed project.

By what month and year will the project be completed? DEC 31, 2029

MORE DETAIL SEE "#18" CONSTRUCTION CONCERNS

The Resource Planning Committee is allowed to consider topics in addition to the above. Please provide information on additional topics you think the Committee should or may consider in evaluating this project.

SEE ATTACHED - COVERED UNDER "ITEM #18"

Note that a conditional use permit will generally remain in effect as long as the conditions and requirements upon which the permit was issued are followed. Subsequent owners of the property are generally allowed to continue the use, subject to those conditions and requirements. An affidavit is to be recorded with the deed to provide successors in interest notice of the conditional use permit and conditions and requirements.

The Resource Planning Committee may, however, impose conditions regarding the permit's duration, transfer, or renewal, in addition to any other conditions pertaining to ordinance standards or the specific criteria listed above. For example, the Committee may grant a limited term conditional use permit if a reasonable basis exists for such limitation. Any limited term conditional use permit may be subject to renewal after a re-evaluation of the use via a hearing before the Resource Planning Committee.

County of Door
LAND USE SERVICES
County Government Center
421 Nebraska Street
Sturgeon Bay, WI 54235

Phone: (920) 746-2323
FAX: (920) 746-2387
Website: map.co.door.wi.us/planning

PROJECT SCOPE DECLARATION

[2017 Wisconsin Act 68; Effective November 29, 2017]

Please provide a description of your project.

(SEE ATTACHED)

§ 66.10015(2)(b), Wisconsin Statutes, provides as follows:

> "If a project requires more than one approval or approvals from one or more political subdivisions and the applicant identifies the full scope of the project at the time of filing the application for the first approval required for the project, the existing requirements applicable in each political subdivision at the time of filing the application for the first approval required for the project shall be applicable to all subsequent approvals required for the project, unless the applicant and the political subdivision agree otherwise."

Please check which of the following two statements applies to this project.

- [x] This is the first application filed for the project in which the full scope of the project has been identified. I acknowledge and understand that, for purposes of § 66.10015(2)(b), Wis. Stats., the full scope of the project is identified in this application.

- [ ] This is not the first application filed for this project where the full scope of the project was identified. The first application was filed with the Town/Village/City/County/State of _____ on the____day of _____, 20 ___. I acknowledge and understand that, for purposes of § 66.10015(2)(b), Wis. Stats., the full scope of the project was identified in the first application.

This Declaration is incorporated into and made part of the associated Door County application.

Property Owner(s) Name(s):

Margaret Dreutzer

Signature Margaret Dreutzer Date: 11/27/19

Signature: _____ Date: _____

Parcel Number (of Project): _____ - ____ - _____ (SEE ATTACHED)

Fire Number & Street Address (of Project): _____

PROJECT TO BE LOCATED ON THE FOLLOWING PROPERTY PARCELS:

022-01-12282512	2.64 Acres	Zoned RC & Portion SE
022-01-12282512A	5.00 Acres	Zoned RC
022-01-12282512B	4.37 Acres	Zoned RC
022-01-13282511	24.52 Acres	Zoned RC
022-02-18282622G	5.68 Acres	Zoned RC & Portion SE
022-01-13282511P	14.83 Acres	Zoned SF 20

All of the above parcels are located in a "non-core" area.

PROPSED LAND USES FOR ABOVE PARCELS:

Multiple Occupancy Development (MOD) – The portion of the lots designated for the MOD shall comply with the applicable requirements of Section 4.08(8)- Multiple Occupancy Development Requirements of the Door County Comprehensive Zoning ordinance (DCCZO). Included in submittals are 8 proposed accessory buildings to be constructed in compliance with Section 4.08(8)- Multiple Occupancy Development Requirements of the Door County Comprehensive Zoning ordinance (DCCZO).

Campground Requirements – The portion of lots designated for the Class A MotorCoaches shall comply with the applicable requirements of Section 4.07(2)-Campgrounds and Trailer Camps of the Door County Comprehensive Zoning ordinance (DCCZO).

Club House – Use of the clubhouse will only be used by the owner(s)/tenants of the MOD & Campground. It will therefore be considered as an accessory building to the MOD & Campground.

Tax Parcel Report

Courtesy of the Door County Land Information Office

... from the Web Map of ...
(//www.co.door.wi.gov)
Door County, Wisconsin
... for all seasons!

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Data Current through 10th November 2017

Parcel Number: 022011228 2512 - TOWN OF SEVASTOPOL
PLSS Section-Town-Range: Gov Lot 2 12-28-25
Property Address: 0

Owner Name: MARGARET DREUTZER
Mailing Address:
4883 HARDER HILL RD
STURGEON BAY, WI 54235

Legal Description:
GOVT LOT 2 SEC 12-28-25
EXC TRACTS SOLD OFF

Other Owners:

Recorded Doc: DOC# 746899, 714335

Valuations: 2017
Acres: 2.64
Land Value: $72700
Improved Value: $0
Forest Value: $0

School District: SEV

Taxes: 2016
Real Estate Tax: $766.02
Special Tax: $0.00
Forest Tax: $0.00
Est Fair Market Val: $73900

Tax Parcel Report

Courtesy of the Door County Land Information Office

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Data Current through 10th November 2017

Parcel Number: 022011228 2512A - TOWN OF SEVASTOPOL
PLSS Section-Town-Range: Gov Lot 2 12-28-25
Property Address: 0

Owner Name: MARGARET DREUTZER
Mailing Address:
4883 HARDER HILL RD
STURGEON BAY, WI 54235

Legal Description:
A TRACT OF LAND IN GL#2 SEC 12-28-25 & FRAC. SEC.13; DESC IN 552/581

Other Owners:

Recorded Doc: DOC# 746899, 714335

Valuations: 2017
Acres: 5.00
Land Value: $12800
Improved Value: $0
Forest Value: $0

School District: SEV

Taxes: 2016
Real Estate Tax: $134.87
Special Tax: $0.00
Forest Tax: $0.00
Est Fair Market Val: $13000

Tax Parcel Report

Courtesy of the Door County Land Information Office

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Data Current through 10th November 2017

Parcel Number: 022011228 2512B - TOWN OF SEVASTOPOL
PLSS Section-Town-Range: Gov Lot 2 12-28-25
Property Address: 0

Owner Name: MARGARET DREUTZER
Mailing Address:
4883 HARDER HILL RD
STURGEON BAY, WI 54235

Legal Description:
A TRACT OF LAND IN GL#2 SEC
12-28-25 & FRAC. SEC.13;
DESC IN 553/567
EXC CSM 82, V.3 & 245, V.3

Other Owners:

Recorded Doc: DOC# 746899, 714335

Valuations: 2017
Acres: 4.37
Land Value: $12500
Improved Value: $0
Forest Value: $0

School District: SEV

Taxes: 2016
Real Estate Tax: $131.71
Special Tax: $0.00
Forest Tax: $0.00
Est Fair Market Val: $12700

Tax Parcel Report

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Data Current through 15th February 2019

Parcel Number: 0220113282511 - TOWN OF SEVASTOPOL
PLSS Section-Town-Range: NE 1/4 of NE 1/4 13-28-25
Property Address: 0

Owner Name: MARGARET DREUTZER
Mailing Address:
4883 HARDER HILL RD
STURGEON BAY, WI 54235

Legal Description:
FRACTIONAL SEC 13-28-25N OF
COM NE COR SEC 12 S1324'BG
S38DW1011'TO SHR GREEN BAY
SUBJ TO EASEMENT 371-658 &
EXC PARCELS SOLD OFF & TRCT
more legal not shown

Other Owners:

Recorded Doc: DOC# 746899, 714335

School District: SEV

Valuations: 2018
Acres: 24.52
Land Value: $37900
Improved Value: $0
Forest Value: $0

Taxes: 2018
Real Estate Tax: $405.69
Special Tax: $0.00
Forest Tax: $0.00
Est Fair Market Val: $38000

Tax Parcel Report

Courtesy of the Door County Land Information Office

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Data Current through 10th November 2017

Parcel Number: 022021828622G - TOWN OF SEVASTOPOL
PLSS Section-Town-Range: Gov Lot 1 18-28-26
Property Address: 0

Owner Name: MARGARET DREUTZER
Mailing Address:
4883 HARDER HILL RD
STURGEON BAY, WI 54235

Legal Description:
COM 1324.29'S NW COR SEC 18
:N89*E469.56' N28*W409' TO
INTSCTN TOP OF QUARRY NELY
& NWLY ALG QUARRY 707' TO
SEC LN S TO BG.

Other Owners:

Recorded Doc: DOC# 746899, 714587

School District: SEV

Valuations: 2017
Acres: 5.68
Land Value: $49900
Improved Value: $0
Forest Value: $0

Taxes: 2016
Real Estate Tax: $525.77
Special Tax: $0.00
Forest Tax: $0.00
Est Fair Market Val: $50700

Tax Parcel Report

Courtesy of the Door County Land Information Office

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Data Current through 10th November 2017

Parcel Number: 022011328 2511P - TOWN OF SEVASTOPOL PORTION - ?
PLSS Section-Town-Range: SE 1/4 of NE 1/4 13-28-25
Property Address: 0

Owner Name: MARGARET DREUTZER
Mailing Address:
4883 HARDER HILL RD
STURGEON BAY, WI 54235

Legal Description:
COM 1324.29'S NE COR SEC 13
:S89*W1333.94' S413' SELY
ALG HWM 914' N38*E963' BG.
EXC TRCT REC'D DOC #721656
INCL TRCT REC'D DOC #721657

Other Owners:

Recorded Doc: DOC# 746899, 721657

School District: SEV

Valuations: 2017
Acres: 14.83
Land Value: $131400
Improved Value: $0
Forest Value: $0

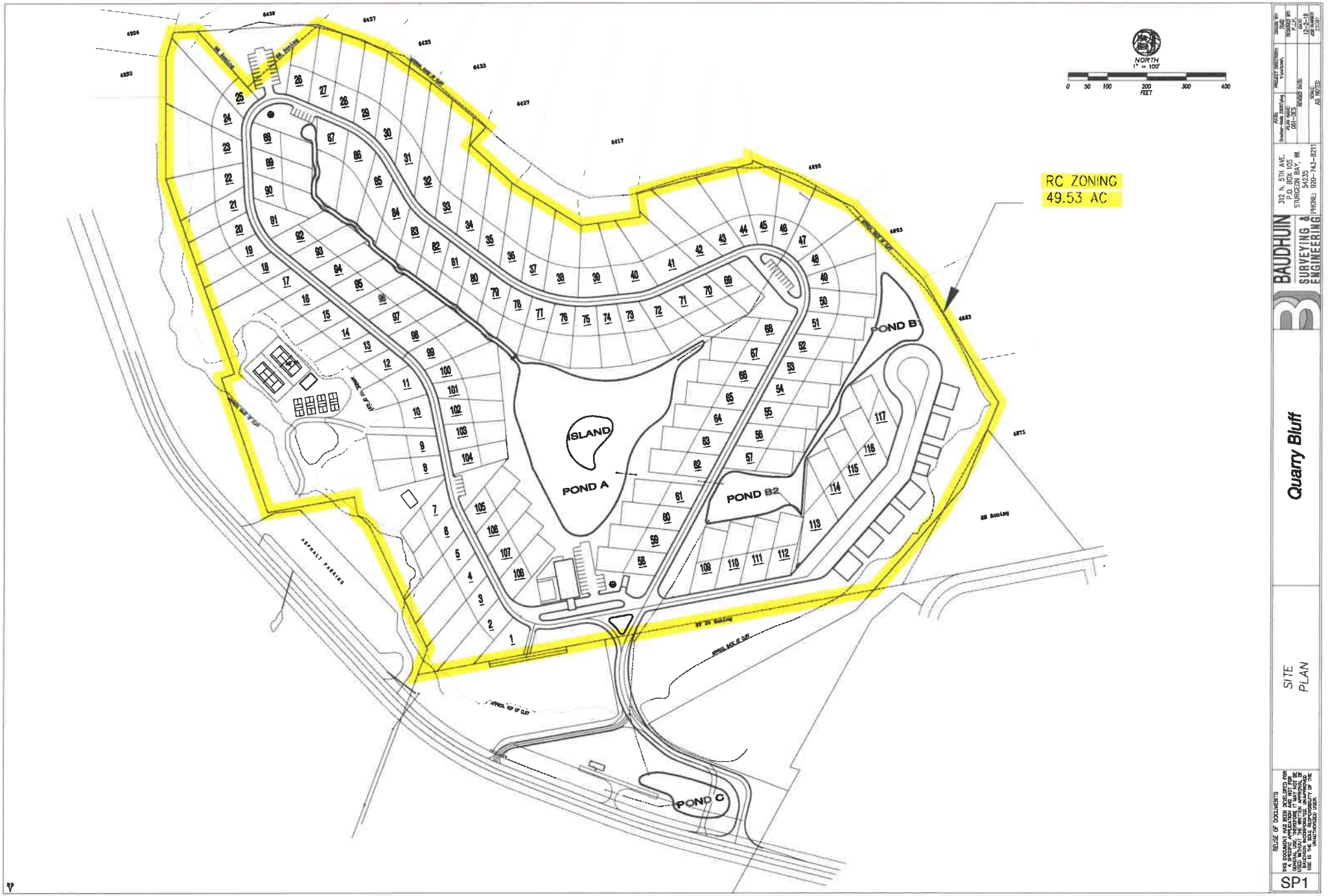
Taxes: 2016
Real Estate Tax: $1384.53
Special Tax: $0.00
Forest Tax: $0.00
Est Fair Market Val: $133500

The Project

It is our intention to create a multiple occupancy development (MOD) that is aimed at those who enjoy their Class A motor coach experience and wish to purchase their own unit in a highly upscale environment. The development will be specifically engineered and designed for their convenience. Owners will have the option to construct a single-family dwelling on their site to be used in conjunction with their motor coach. The site designs will integrate detailed landscaping with an outdoor living experience. The development will feature other upscale amenities that are fundamental to the motor coach enthusiast. A focal point will be an exceedingly well-appointed private clubhouse, commensurate with the expectations of our owner demographic. Our research shows a demand for this type of development, especially in Door County, which currently under-serves the Class A motor coach clientele.

This project will allow private ownership of a parcel of property (unit) along with the opportunity to build a single-family residence. This project is not a campground and will not accommodate or allow "camping" in the traditional sense. There will be no tents, trailers, wood campfires, or many of the amenities and activities associated with a traditional campground. The project will, however, cater only to Class A motor coaches. A Class A motor coach, by definition, is a motor home that is constructed with a heavy-duty tour bus frame and for the most part are the largest and most expensive motor homes built. Price points for these motor coaches range from several hundred thousand to well over a million dollars. The only reason we have to apply for permits under the usage category of "campground" and use the term "campground" is due to the fact that under current zoning, it is the only usage category that allows owners to occupy their motor coach for more than 30 days in a given year. A typical owner will likely have well in excess of a million dollars in combined value in their land parcel, Class A motor coach, which they are permitted to occupy on site, and unit improvements including a residential structure and extensive landscaping.

Please see the attached site plan as well as renderings that have been developed depicting the proposed development.



BAUDHUIN SURVEYING & ENGINEERING
312 N. 5TH AVE.
P.O. BOX 105
STURGEON BAY, WI
54235
PHONE: 920-743-8211

Quarry Bluff

SITE PLAN

SP1

NORTH
1" = 100'
0 50 100 200 300 400
FEET
Site Statistics - Impervious Area
Area of Site Accessories (Buildings, Roads, Amenities, etc.) = 286,964 s.f.
Individual Sites - M.O.D.
Area of Site Features (Home, Deck, Patio) = 2,035 s.f. ± / Site
115 Sites = 234,025 s.f. Total
Individual Sites - R.V.
Area of Site Features (Drive, Patio) = 1,365 s.f. ± / Site
117 Sites = 159,705 s.f. Total
Entire Site
Area of Parcel = 2,157,614 s.f. ± (49.53 acres ±)
Total Impervious Surface = 680,694 s.f. ± (15.63 acres ±)
Impervious Surface Ratio = 31.56%
TYPICAL UNIT
1" = 40'
24' ROAD WITH 24' C/G
HOME/ PATIO/ DECK ENVELOPE
LOCATION SKETCH
SITE AREA OF PARCEL USED FOR CALCULATIONS = 2,157,614 S.F. (49.53 ACRES)
1" = 1000'
Cottage (M.O.D.) Area
R.V. Area
Pond A
Pond B1
Pond B2
Pond C
Island
Tennis
Pickleball
Lower Plateau Common Area
Upper Plateau Common Area
Common Area
Private Storage Units (M.O.D. Accessory Buildings)
To Be Retained by Dreutzer
George K. Pinney County Park
Holding Tank
MAIN ENTRANCE
EXISTING DRIVE MAINTAINED AS WALKING PATH & ACCESS FOR EMERGENCY VEHICLE
EXISTING DRIVE TO BE REMOVED
BAUDHUIN
SURVEYING & ENGINEERING
312 N. 5TH AVE.
P.O. BOX 105
STURGEON BAY, WI.
PHONE: 920-743-4211
Quarry Bluff
SITE PLAN
C102

onyx | creative
25001 EMERY ROAD #400, CLEVELAND, OH 44128

onyx | creative
25001 EMERY ROAD #400, CLEVELAND, OH 44128

onyx | creative
25001 EMERY ROAD #400, CLEVELAND, OH 44128

onyx | creative
25001 EMERY ROAD #400, CLEVELAND, OH 44128

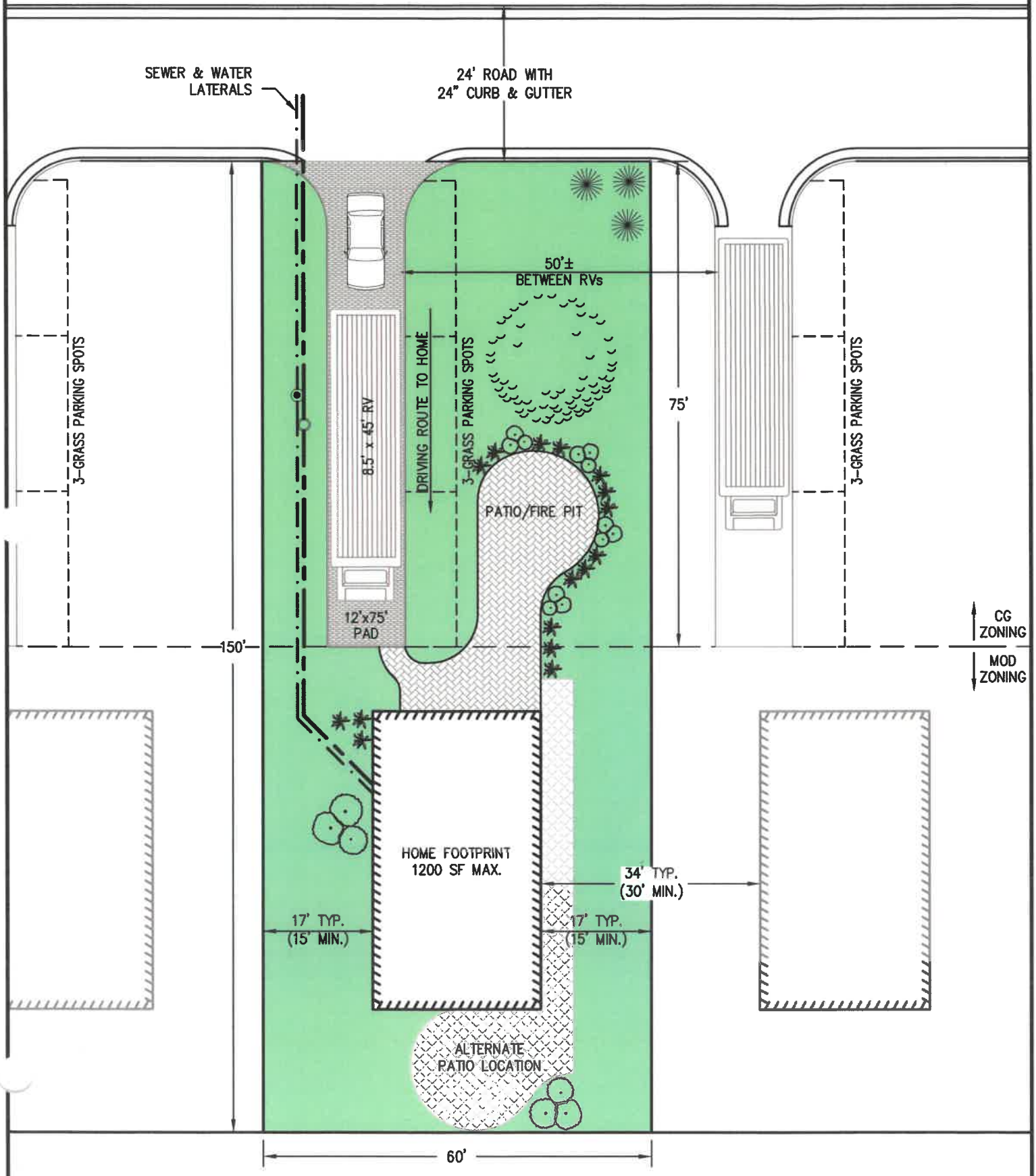
Commander

onyx | creative
25001 EMERY ROAD #400, CLEVELAND, OH 44128

onyx | creative
25001 EMERY ROAD #400, CLEVELAND, OH 44128

TYPICAL HOME SITE

1" = 20'



CAD : Y:\dvb\LDWG\Dreutzer-Goetz 22061\dwg\061-DES JOB NO. 22061

SHEET 1 OF 1

12-2-19

Subject Property -- History of Zoning

In 1976, the Town of Sevastopol adopted Door County Comprehensive Zoning, which brought all the subject property under County zoning jurisdiction. From the onset the property was zoned Recreation (REC). Among other things, this zoning definition included, "...This district provides the development of those recreational uses which are consistent with the maximum recreational use of the water and its shoreland. The development of some residential uses is permitted provided that sanitary facilities are constructed in accordance with plans approved by county public health authorities."

In 1995, Door County completed a comprehensive revision of its zoning ordinance and zoning maps. At that time the Town of Sevastopol adopted the revised zoning ordinance and maps which resulted in the subject property being rezoned from Recreation (REC) to Recreational Commercial (RC). This zoning classification was reaffirmed as such by the County and the Town of Sevastopol during the creation and ratification of their Smart Growth Plan in 2008, as well as subsequent comprehensive plan updates.

The subject property, being zoned Recreational Commercial (RC), allows precisely the type of development we are proposing. The RC classification was created for "high concentrations of recreational uses"...and "favors recreational uses such as golf courses, ski resorts, multiple occupancy developments (MODs), marinas, and restaurants".

The (REC) zoning classification pre-dates the subdivision of the original parcels, and the subsequent creation and sale of several single-family lots overlooking the subject property. Those who purchased and built homes on those lots knew, or should have known, that the adjacent subject property could someday be developed in a manner similar to what we are proposing. As the zoning classification has remained essentially unchanged for 43 years, and has been incorporated in every iteration of the Sevastopol comprehensive plan since that time, it's clear that a MOD of the size and scope of what we are proposing is not only allowed, but something that the zoning code promotes for (RC) districts. In fact, the specifications of the (RC) classification allow for a much larger MOD, with approximately double the bedroom density of the project we are proposing.

Subject Property – History of Ownership by the Druetzers

The subject properties as well as other adjacent properties were purchased by Peg Druetzer and her late husband in 1992. Being real estate professionals, the intent of purchasing the properties was to subdivide and sell various parcels. Shortly after purchasing the properties, the land to the east, overlooking the quarry, was subdivided into single family lots. The first lots were sold in 1993. Please see attachment for marketing materials that were prepared in 1995 to sell the entire subject property as well as other lots they owned. A majority of the easterly lots were sold from 1993 to 1998. Peg and her husband Ken currently reside on one the lots that overlooks the quarry. Currently the Druetzers have numerous lots for sale on Cty Hwy B both north and south of Pinney Park as well as two lots east and above the subject property.

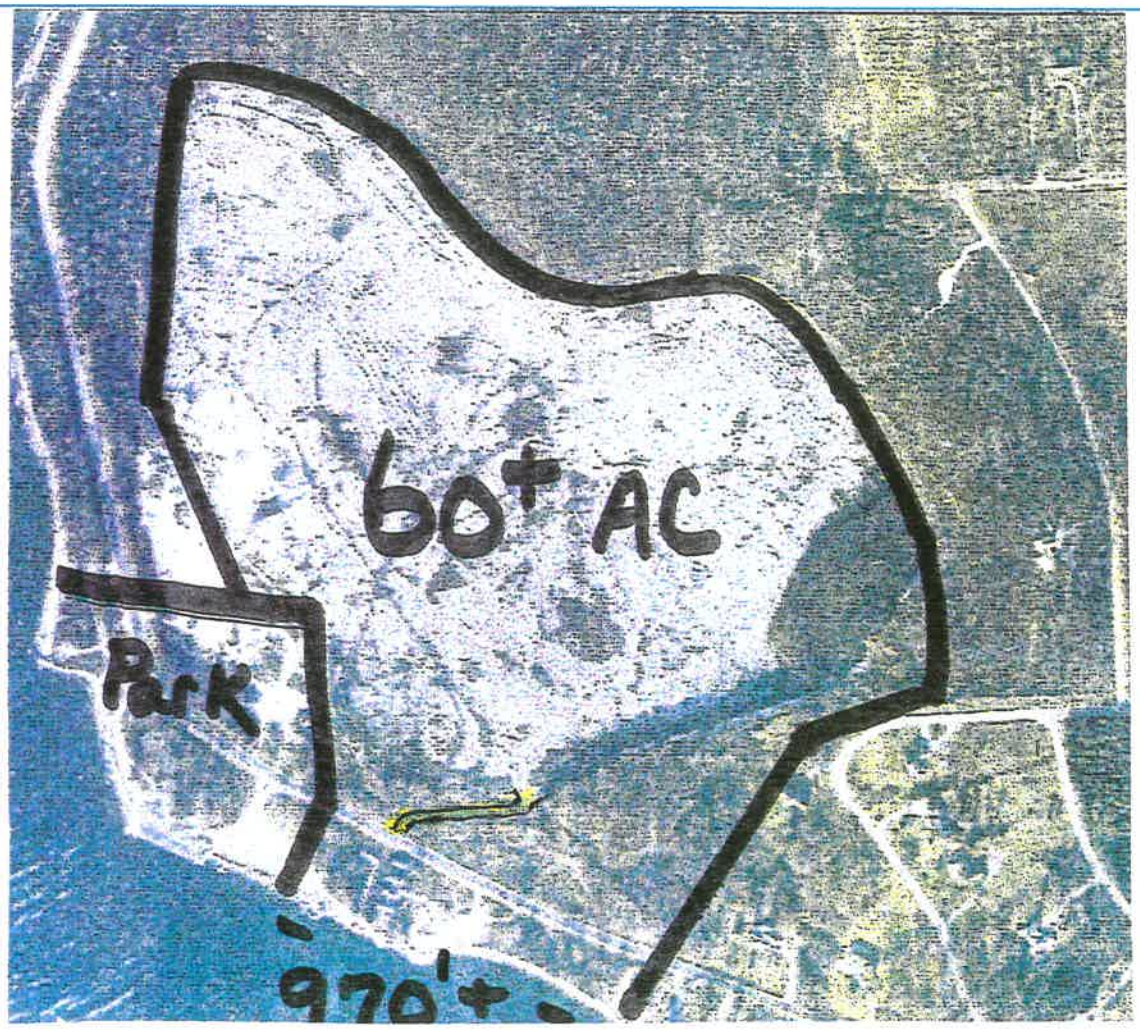
Shortly after the purchase of the subject properties in 1992, the Druetzers also investigated various possibilities of how to develop a portion of the quarry property into a major type of development. Several meetings took place with master planner Ralph Bergman, who at that time was employed by Portside Properties, a local construction and development company. Several options with various types of developments were discussed. Please see attached. Due to economic and other constraints the projects never took place.

Discussions took place in 2004 regarding the improvements of the Old Quarry County Park, which at the time was a very basic boat launch. The future project consisted of a six-lane boat launch, construction of a 60,000sf harbor of refuge and increased parking. Peg and her late husband were instrumental in donating the required property to ensure that the park could be developed. Construction started in 2005 and completed in 2006. The boat launch is known today as the George C. Pinney Park and is owned by the County of Door.

Several times Peg and her late husband approached the Door County Parks Department as well as other non-profit groups to purchase the subject property. Numerous discussions took place and with lack of interest the subject property remained with the Druetzer family.

In 2014, one of the current developers approached Peg Druetzer with the intent of a developing the subject property. The development concept was high end multifamily. For various reasons the development format was not pursued.

In late spring of 2018, the current developers initiated discussions with the Door County Planning Dept. regarding the concept of the development that is being proposed.



BLUFF VIEW PROPERTY
3000'

BAY SHORE PROPERTY
970'

$1,000,000.

SHORESIDE REALTY
130 North 4th Avenue
Sturgeon Bay, Wisconsin 54235
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-1995-

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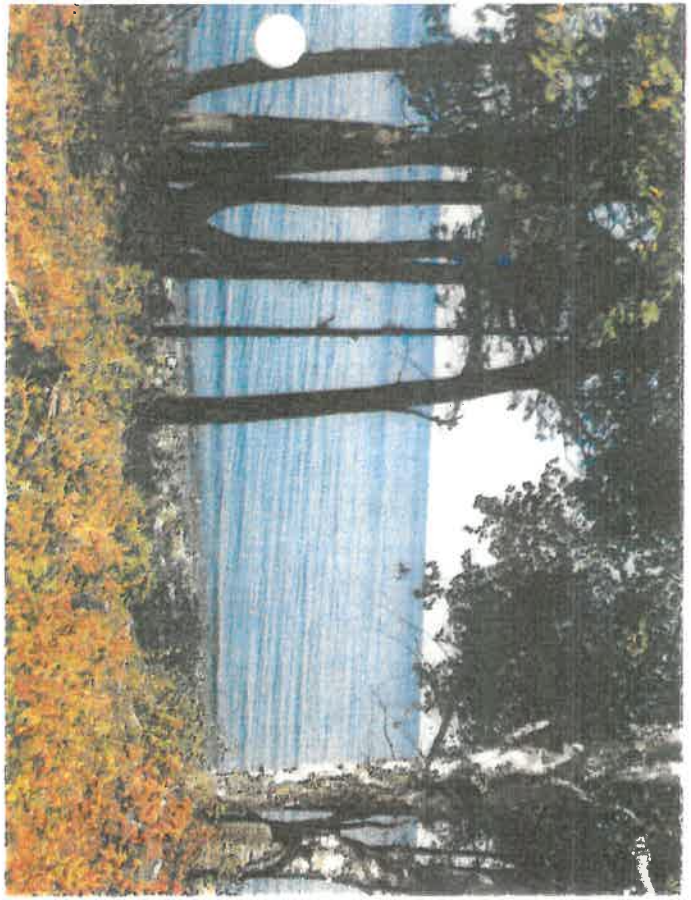
The breathtaking views over the waters of Sturgeon Bay and Green Bay, Sawyer Harbor and the city lights at night, make these "World Class" sites the finest in the county. Each afternoon a different sunset from your "Perch" atop the quarry wall will provide a majestic close to a peaceful day.

Your private waterfront is included with each quarry bluff estate. Over 300 feet of priceless Bay Shore frontage has been set aside for your use as an owner of the bluff property. This unique combination of the spectacular views and your own water frontage make this the premier property in Door County.

–1995–



PANORAMIC

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VIEWS

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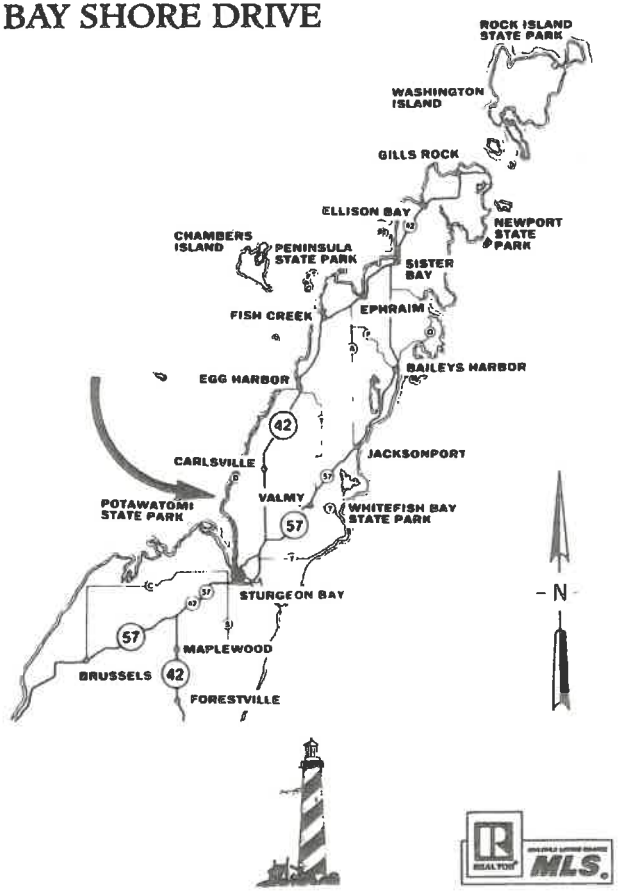
WATERFRONT

PRISTINE • SUNSETS
BAY SHORE DRIVE



MLS.

SOLD

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1ST IN SERVICE

SHORESIDE REALTY

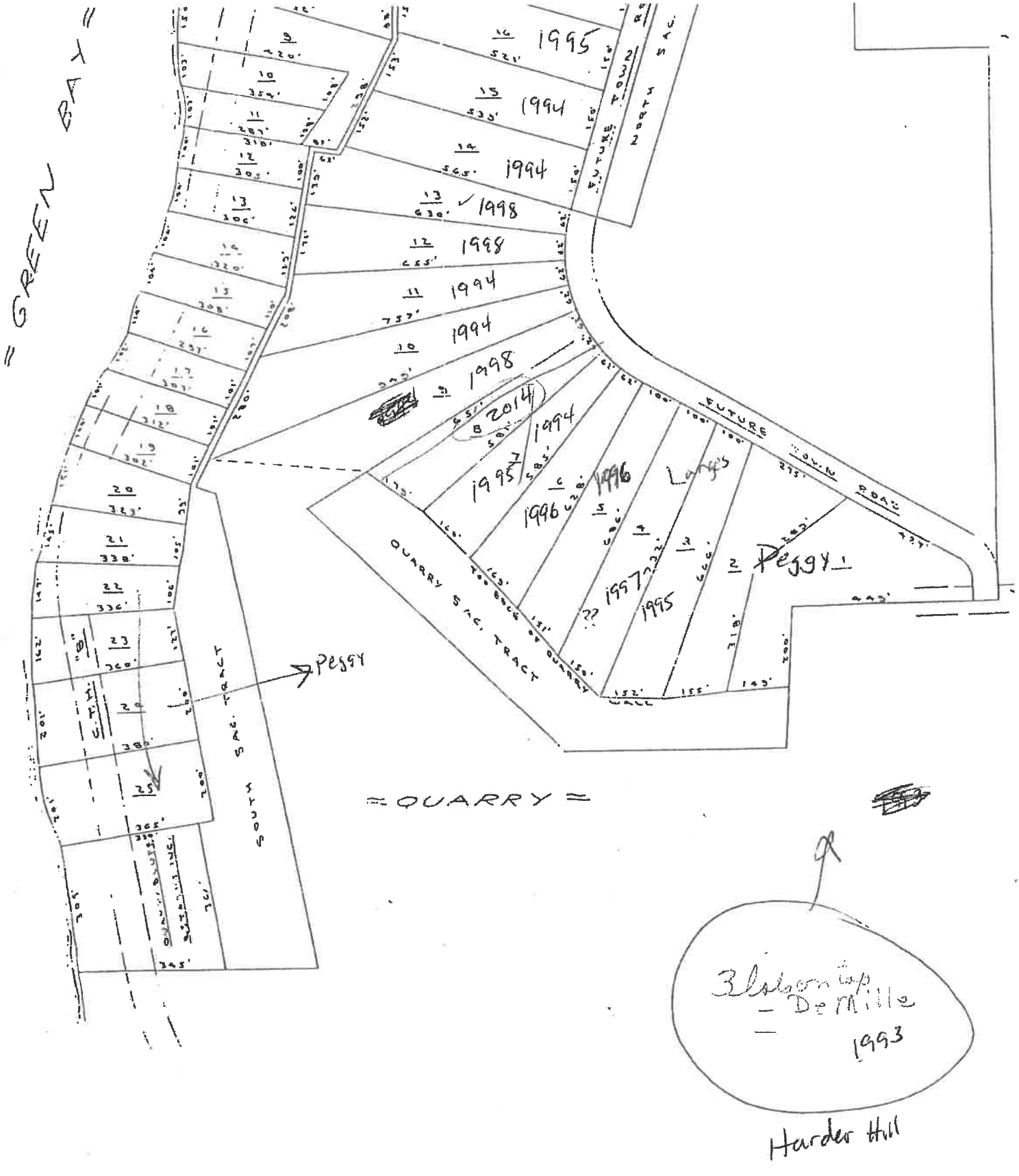
SUNSET SHORES

ON THE WATERS OF
BEAUTIFUL GREEN BAY

100 - 150 FEET OF
SHOREFRONT

BUILDING SITES ARE
TOTALLY WOODED FOR AS
MUCH PRIVACY AS YOU
DESIRE

-1995-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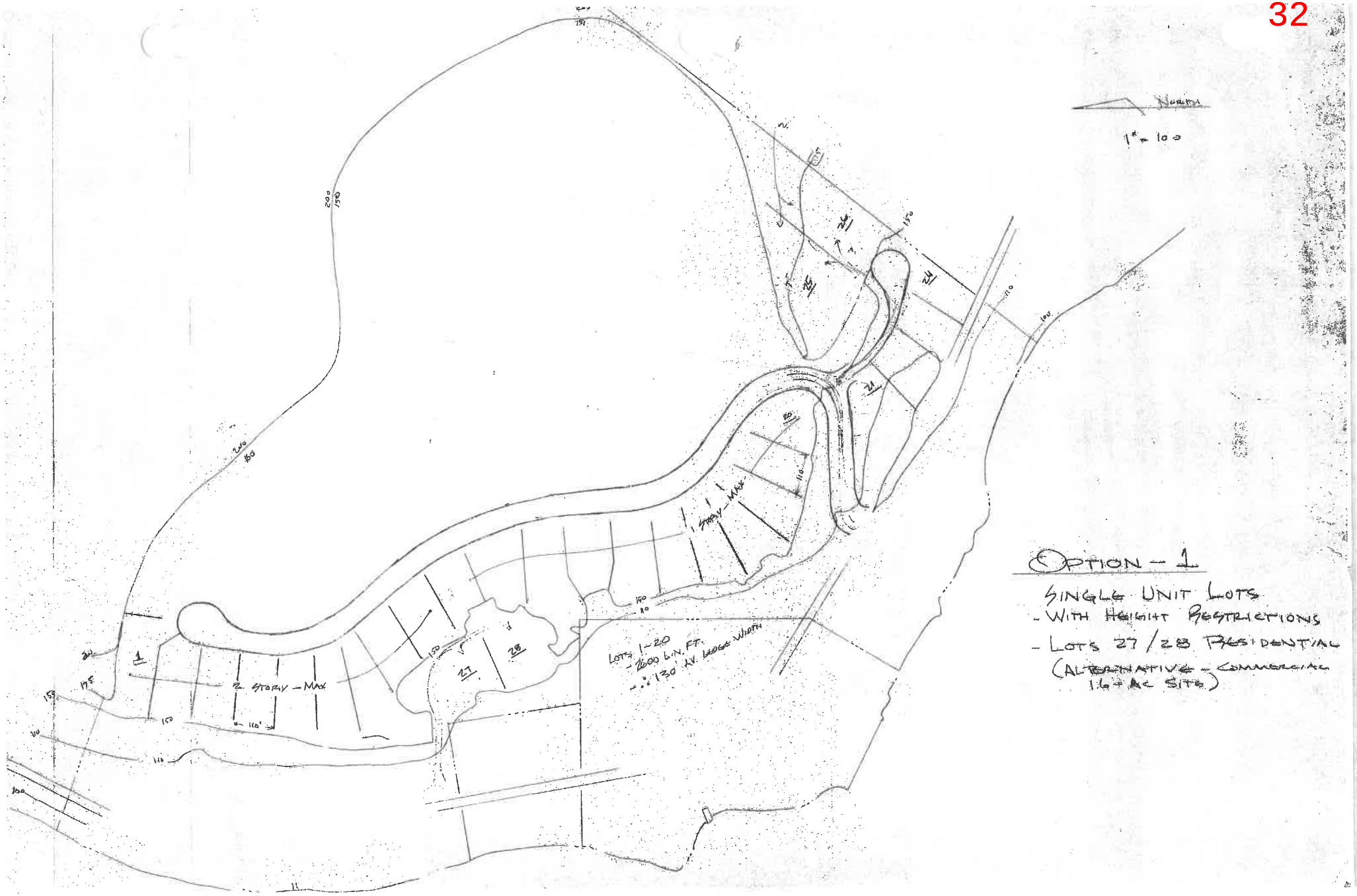
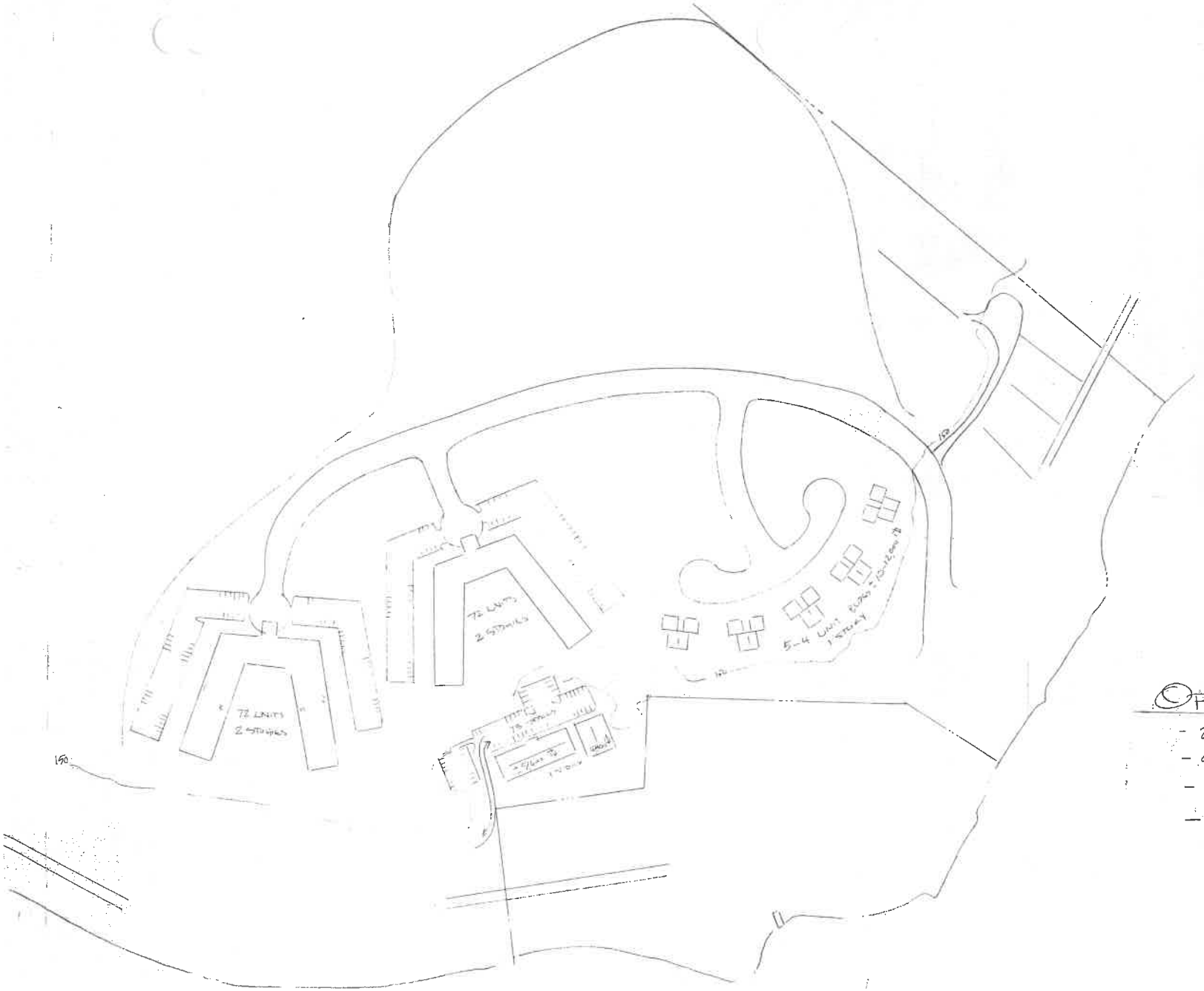
NORTH SAC.
QUARRY SAC. TRACT
TOO EDGE OF QUARRY WALL
SOUTH SAC. TRACT
Peggy
= QUARRY =
3 lobsontop
– DeMille
1993
Harder Hill


NORTH
1" = 100
OPTION - 1
SINGLE UNIT LOTS
- WITH HEIGHT RESTRICTIONS
- LOTS 27 / 28 RESIDENTIAL
(ALTERNATIVE - COMMERCIAL
1.6± AC SITE)
LOTS 1-20
- 2600 S.F.
- 130' AV. LEDGE WIDTH
2 STORY - MAX
1 STORY - MAX

OPTION - 3

RENTAL - RECREATION COMPLEX

- HOTEL - 108 UNITS
- DUPLEX UNITS - 52 UNITS
- RECREATION CENTER



OPTION 4

- 2, 72 UNIT HOTEL CONDOS
- 5, 4 UNIT 1 STORY BLDGS
- 14,400 SQFT COMMERCIAL
- ANCILLARY RESIDENTIAL UNITS

NORTH
1" = 100'
SCALE
0 50 100 200 300 400
FEET
Baudhuin Incorporated
Site Engineering • Surveying • Soil science
55 S. 3RD AVENUE
P.O. BOX 105
STURGEON BAY, WI.
54235
PHONE: 920-743-8211
FAX: 920-743-8217
Dreutzer Trust
CONCEPT PLAN
CP1

Subject Property – Zoning Summary of Permitted uses.

The subject property is zoned Recreation Commercial (RC) and allows for certain uses that do not require a conditional use permit. Following are some examples of permitted uses:

- Bed and Breakfast
- Boarding houses/employee housing
- Dwellings for agricultural and processing employees
- Conservation Subdivision
- Duplex Developments

The two permitted uses that are viable developments for the subject property that would provide more density than we are presently purposing are the Conservation Subdivision and Duplex Development.

Conservation Subdivision -- The purpose of this type of development is to preserve open space by allowing the clustering of building activities into a more condensed area. A density of 3.27 dwelling units per acre is allowed for calculating the total number of dwelling units. Therefore, performing the calculation on the maximum density a total of 161 dwelling units (houses) can be constructed. This number is arrived by multiplying the number of acres zoned RC (49.53) by the allowed density of 3.27 homes per acre. Each dwelling unit can have an unlimited number of bedrooms as long as all setbacks and building codes are met.

Duplex Development – This development format would not require any land to be set aside for conservation. Each duplex lot would have to be a minimum 20,000sf. Again, taking 49.53 acres of RC would allow for 107 duplex buildings or 214 dwelling units. Also as mentioned above, each dwelling unit can have an unlimited number of bedrooms as long as all setbacks and building codes are met.

Again, these are permitted uses for which there is no public input and building permits can be obtained over the counter.

In summary, the development we are presently purposing is 115 dwelling units. Again, this is at full build-out. The number of bedrooms we are proposing is 240. The number of bedrooms allowed could be 378. This number is arrived by multiplying the number of acres allowed for dwelling units (37.8) by 10 bedrooms per acre. Therefore, from a bedroom standpoint we are only utilizing 63% of the density that is allowed.

SECTION #1

Property Values

Item #1

Whether the Proposed Project Will Adversely Affect Property Values in the Area

The proposed development should not have a negative effect on adjacent property owner's property values. Presently the property to be development is an abandoned quarry with an assessed value of approx. $250,000. The assessed value of the entire development, once completed, will be in the $40M range. The average assessed value for each unit, when fully developed, will be in the $450K to $750K range, which is similar to the adjacent easterly property owners. In addition, knowing that property values are affected by obstructing water views, and the concerns of the property owners easterly and above the development, an engineered sight line study has been completed and determined that the water view of the property owners will be minimally affected.

Property Value Impact:

The proposed project will not adversely affect property values in the area for the following reasons:

1. The existing quarry site is an un-reclaimed mine site.
2. Current mine sites are required to have a reclamation plan completed. The reclamation plans typically require a minimum amount of soil cap over the mine site. Re-purposing as lots is typical.
3. Such rules were not in effect at the time this site was mined.
4. The site has accumulated piles of debris and even unwelcomed trash over the years.
5. Very little plant growth and aesthetic value exists on the bare rock surface.
6. The site will be developed into a very upscale, gated, residential community.
7. Bare rock surfaces will be replaced with soil and greater than 2/3rds of the site established in landscaped green space and decorative ponds.
8. Homes and motor coach areas will receive extensive landscape treatments.
9. The value of the home and motor coach on each lot will likely exceed existing residential values in the area.
10. The demographics associated with this type of development will be 55 to 75-year-old individuals.
11. This project will be protected from unwanted noises and nuisance through implementing extensive restrictive use and building covenants.
12. This project will be a boost to the local economy. Local businesses will benefit greatly from the influx of the new residents.
13. The proposed use will definitely be a more desirable fit for the community than other uses permitted under the existing Recreational Commercial zoning district.

Additional documentation is included supporting our position that the proposed development will not adversely affect nearby property values.

- The first study by Bill Gassett, a nationally recognized leader in property valuation lists several factors that can lower neighboring property values. In his report there is no indication that any type of new residential development will negatively impact nearby neighbors.

- The second study is an in-depth report investigating how commercial developments do not have a negative affect on neighboring residential properties. Although the report is quite lengthy and is evaluating commercial property in lieu of a new residential development being constructed, it does have some relevance. Please review pages 4 and 21 basically determining that even commercial developments, in certain situations, do not have a negative impact on nearby residential neighborhoods.

We currently are working with a consulting firm investigating property values and should have additional information in the near future.

Factors That Can Lower Your Home's Value

Considering that your home is probably one of (if not the) biggest investment you own; it only makes sense to do what you can to preserve its value. But if you are like most homeowners, you may not be aware of everything that can lower the value of your property. Some are obvious; some are less so.

If you're smart, you'll look out for some of the items I'm going to mention to protect your investment(s) both now and in the future.

Many of the things that will lower a home's value can be found in and around a property. It is important to understand how these factors can influence the long-term value of a home.

Sometimes buyers get so caught up in the excitement of a homes interior appeal that they forget that the house is an investment as well. External factors can significantly influence a properties value.

It's too late when you conclude later on that you've bought a lemon nobody wants. Here are some things to consider when deciding how to select a neighborhood to live in. Understand what people want and don't want!

Keep reading to see the things that can decrease property values.

Proximity to Power Lines

Power lines play a vital role in modern life, bringing much-needed electricity to just about everyone. Unfortunately, no matter how important they are, power lines are not a good thing to have nearby when you are a homeowner.

They buzz, they are imposing, they're unattractive, and they make many people worry about adverse health effects related to living near them. The negative health effects of power lines are inconclusive. However, many people like to take the better be safe than sorry policy.

Some research projects suggest that living near to high-voltage power lines can increase the incidence of several kinds of cancer, as well as other diseases. There is also some association with headaches, fatigue, anxiety, insomnia, rashes and even muscle pain.

A home may seem like a real bargain if it is near power lines, but there is a reason for the low price. You should always consult with a local real estate expert when planning on buying near power lines to see how much it will impact a homes market value.

Proximity to a Gun Range

While some people love the idea having a shooting range nearby to participate in a hobby, rarely does this translate well when considering purchasing a home. If your home is a few miles away – great! If, however, the gun range is right next door you better think twice about buying. Not only can gun ranges be loud there is the off chance of finding a stray bullet hitting your property or worse a family member.

When considering a home in proximity to a gun range, you should always research the shooting schedule. Some places shoot daily while others might only be on the weekend. Make sure you figure out your tolerance for hearing gunshots before purchasing a home.

Proximity to Train Tracks

Being close to a commuter rail is a highly desirable perk when it comes to homeownership. Lots of home buyers want to be located close a commuter rail. For example where I'm based in Southborough Massachusetts, one of the reasons buyers find the town desirable is the fact the commuter rail to Boston is there.

Being located next to train tracks, on the other hand, is a different story altogether. When your home is located directly next to train tracks, it can drag down the value of your property.

Living next to a train means dealing with the noise at various hours in the day. Additionally, if a buyer has kids, it could deter them from purchasing for safety concerns.

Ask your real estate agent how much of an impact the train has on reducing the market value.

Proximity to a Highway

While being close to commuting routes is ideal for home values, being on top of a freeway is not. If you can see or hear a major thoroughfare more than likely, it will have an adverse impact on home values.

In my hometown of Hopkinton Mass, we have two major highways, The Mass Pike and Route 495 that run through the town. Homes located adjacent to these roads have lower values than identical homes located elsewhere.

Registered Sex Offenders

It is possible to look up the registered sex offenders in any given neighborhood – something that more and more buyers are doing now that they know they can. If buyers see that there is one or more registered sex offenders in your neighborhood, it will drive down the value of your home. One study showed the presence of a sex offender in a neighborhood could lower prices by up to 12%.

It is a scary thought for any parent to consider purchasing a home with a sex offender close by. Laws vary from state to state on disclosing registered sex offenders. A real estate agent may or may not have a handle if a sex offender is living nearby. You should ask though and if you don't get a satisfactory answer go to the local police department.

The Hoarders Next Door

Your neighbors matter when it comes to the price of your home – or more specifically, the way they keep up their property. If your neighbors appear to be hoarders, buyers will be more likely to steer clear of your home.

It doesn't matter if they are technically hoarders or not, what is important is the way the exterior of the property appears. If it is filled with junk, it will drag down your home's value. Understanding how to deal with a troublesome neighbor is important, especially when you are selling a home.

Nobody wants to look at an eye soar next door. Nuisances that are out of someone's control are even more likely to make them skip a property.

Unusual Upgrades

When you own a home in a neighborhood, your property is part of a greater whole that affects the value of your property in multiple ways. While a messy neighbor can cause problems, so can changes you make that are uncharacteristic for your neighborhood.

For instance, if you install a pool in a colder climate, where no one else has them, then it can make your home less desirable. The same goes for improvements that require an extra level of upkeep, like elaborate landscaping. Large fountains and exotic gardens are maintained by staff in luxury neighborhoods. In a regular middle-class neighborhood, they will probably just be seen as extra work.

For this reason, real estate agents are often preaching what improvements will increase a home's value and those that won't.

MSN has an interesting article on renovations that will hurt your home's value. Some of the information in the article may or may not be accurate depending on the property.

For example, they mention not to reach for high-end appliances. Purchasing middle of the road appliances might be wise for most homes but not if you own a luxury estate home.

Excessive Noise Pollution

Noise pollution is something that you can learn to live with – most of the time. But it is not considered desirable by most buyers. Living near a highway, a loud factory, an industrial area, an airport or any other source of regular, noticeable noise is going to be a negative factor when selling your property.

The louder the noise, or the more inconvenient – like loud trains passing by and rumbling the windows at 2 a.m – the more it is going to cause a problem with resale value.

Color and Interior Design

The color of your home can draw in buyers, or it can push them away. The more unusual your color choice, the more likely you are to struggle to find a buyer. Most buyers want a home that fits in with the surrounding area, not one that sticks out. The same problem can arise with the color and interior design of the inside of your home. No matter how much you like the way something looks, if it is too unusual, it may make it harder to sell buyers on it.

The color of your rooms can make or break a sale if they stick out like a sore thumb. Color selection is often an awkward conversation to have with a seller. The owner obviously loves their color selection. The real estate agent, on the other hand, knows it could affect the time of the market and ultimate sale price. You walk a delicate tightrope in explaining this to a seller.

Real estate agents often are explaining the need to remove wallpaper when selling a home. It is highly personal and dates a home. Homes with a lot of wallpaper are significantly harder to sell.

In an Undesirable School District

Many people that buy homes are thinking about having children or already have children. Even if they are not planning on having kids immediately, the home is a usually a long-term purchase, so they will still look at the schools before buying. That is why a bad school system can have a downward effect on the price of your home.

Research has shown over and over again that home buyers will pay more money for properties in a top school district. From experience, those homes that are located in the best school districts hold their value better when market conditions are not ideal. There will always be a better demand for homes with the best schools.

Billboards Near the Home

Billboards are seemingly everywhere, even near residential homes. Studies have shown that proximity to a billboard can lower a home's value. The closer the billboard, the more negative impact it has on the price of the home. A nearby billboard can drag down a home's value by tens of thousands of dollars, which is why many neighborhoods are instituting a no-billboard policy to protect home values.

Located Near Fracking

Fracking operations have exploded across North America to take advantage of natural gas deposits that were previously inaccessible. Unfortunately, there is worry that the fracking process causes problems with groundwater wherever fracking is conducted.

While there is no solid evidence either way about the effects of fracking on groundwater, the fact is that buyers will tend to avoid homes near fracking if at all possible. If your home is within a few miles of a fracking operation, you will notice a decrease in the value of your home. When buying a home with well water, it is always a good idea to do both a quality and quantity test.

Having Noisy Neighbors

Your neighbors are not only a problem if they are messy, but also if they are noisy. Noisy neighbors can definitely drive down the value of your home. The noisier they are, the more people are going to want to avoid living in the area.

Numerous Foreclosures

One foreclosure in your neighborhood will probably not have much impact, if any, on your property's value. But if you happen to be in a neighborhood filled with foreclosures, it will have an adverse effect on the value of your home. Multiple foreclosures imply something is wrong with the area. They also mean the area is more prone to squatters, vandalism, deterioration and general unpleasantness.

A 2013 report by The Alliance for a Just Society, a coalition centered on economic, racial and social equality, found a statistically significant reduction in surround home values, as well as increase in local tax rates. Homes nearby are proven to drop an average of one percent for every seven percent the foreclosed home value drops, according to 2012 RealtyTrac data.

Final Thoughts

As you can see, some factors can decrease the value of a home. It is important to consult with a local real estate agent to determine exactly how much. Be sure you understand how your appreciation rate will change with one of these problems in proximity to your home. Far too many people do not realize the impact of external forces on real estate values.

About the Author: The above Real Estate information on the **things that will lower a home's value** was provided by Bill Gassett, a Nationally recognized leader in his field. Bill can be reached via email at billgassett@remaxexec.com or by phone at 508-625-0191. Bill has helped people move in and out of many Metrowest towns for the last 30+ Years.

THE IMPACT OF COMMERCIAL DEVELOPMENT ON SURROUNDING RESIDENTIAL PROPERTY VALUES

Jonathan A. Wiley, Ph.D.
Associate Professor
Department of Real Estate
J. Mack Robinson College of Business
Georgia State University
jwiley@gsu.edu

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April 2015

THE IMPACT OF COMMERCIAL DEVELOPMENT ON SURROUNDING RESIDENTIAL PROPERTY VALUES

Executive Summary

This study examines the impact of commercial development on surrounding residential property values. The topic is explored utilizing an innovative approach that combines multiple data sources for the Atlanta, Georgia metropolitan area. Residential transaction prices in the neighborhood immediately surrounding a new commercial development are evaluated using a matched sample methodology and hedonic pricing models. Georgia MLS data – totaling over 1.5 million transactions of single-family detached properties – is merged with a registry of commercial property deliveries collected from CoStar Market Reports for Atlanta. CoStar Reports account for project delivery dates and property characteristics, such as property type, building size, category, and precise location.

Development impacts are evaluated at the .5, .75 and 1 mile radius surrounding the site. For each observation of a transaction that occurs within the specified radius, a matched sample is constructed that consists of all transactions from that calendar quarter in the same zip code (but outside the radius) for properties that have the same number of bedrooms, same number of bathrooms and were constructed within five years of the subject property. Only transactions that occur under normal sale conditions are considered. In doing so, the empirical results relate housing values for highly similar assets that are sold inside the radius to those that are sold just outside the radius but in the same zip code, and this comparison is made at all possible points in time relative to the project completion date. Valuation differences for properties sold inside the radius are

available as early as 20 years prior to and up to eight years following development completion. Fixed effects variables are applied to control for differences in submarkets, market timing within submarkets, property-specific physical attributes, and transaction-specific financial conditions – attempting to isolate the component of relative house price change that can be attributed to the introduction of a new commercial development.

Property types for new development considered in this study include industrial, office and retail spanning the period 2006 to 2014. Interactions between housing markets and commercial developments are revealed in the analysis, with project completions treated as an event study. Sites targeted for new industrial development exist in neighborhoods where values are relatively lower and already experiencing a downward trend in advance of the project completion. While price compression continues in the post-completion period, the trajectory is not significantly different than the counterfactual projection (supposing no industrial development had occurred). Industrial is one of the least desirable land uses, so it is not surprising to observe industrial development rights allocated in localities where housing values are on the decline. In close proximity to industrial development sites, a localized contraction in house prices appears during the predevelopment period and this may be the market response to a zoning change that allows the new project to be constructed. However, the focus in this study is on the impact of development completions and, lacking additional information about the particular timing of permitting and approvals, it is difficult to disentangle whether zoning changes cause prices to decline. Or, instead, do zoning changes that favor industrial development occur in areas that already have declining housing values? The sample of industrial developments includes a disproportionate count of large-scale projects (e.g.,

those delivering more than 150,000 square feet of gross leasable area), yet the existing trend is largely unaffected in the period that follows an industrial development completion.

By comparison, site selection for office development occurs in neighborhoods that are relatively more expensive, and at times when values are recently increasing. Post-completion, the trend stabilizes at elevated price points in recipient neighborhoods for new office buildings, yet the valuation spread is no longer increasing. Out of 273 new office developments identified for Atlanta during 2006 to 2014, a total of 252 are classified as either small projects (less than 100,000 square feet of building area) or suburban office (not located in Downtown, Midtown, Buckhead or Central Perimeter). The findings are heavily influenced by small projects and suburban office, rather than high-rise CBD office towers. Housing values appear largely unchanged by new office deliveries over the long-horizon.

In the immediate vicinity of retail development site, home prices are relatively lower than the surrounding area during the period leading up to the development. While the trend is trivial prior to completion, it is significantly impacted in the period immediately following a new retail delivery. Home prices inside the radius are initially relatively lower (even more so than before), but set on a path that is steadily increasing relative to comparables in the surrounding area. It takes only a couple of years for the initial reduction to be more than offset, and – within a few years after that – home prices inside the radius even surpass those in the surrounding area (when previously they were significantly lower). Of the three commercial real estate product types considered, proximity to retail development is the most likely to be considered a neighborhood

amenity and an important aspect to community revitalization – although it can take a few years for the submarket to fully incorporate positive price effects following the completion of a new shopping center.

Perhaps most surprising is the lack of evidence for negative and significant impacts of commercial developments on housing values. Scores of political arguments to the contrary are voiced at local debates across the nation, yet this research does not find substantive evidence of a negative interaction.

Background & Synthesis of Relevant Literature

Numerous neighborhood externalities have been evaluated for their impact on residential property values, including rail transit stations (Grass, 1992; Gatzlaff and Smith, 1993; Bowes and Ihlanfeldt, 2001; Debrezion, Pels and Rietveld, 2007), greenbelts and open spaces (Correll, Lillydahl and Singell, 1978; Bolitzer and Netusil, 2000; Irwin, 2002; Anderson and West, 2006), brownfields (Kaufman and Cloutier, 2006), airport noise (Espey and Lopez, 2000), churches (Carroll, Clauretie and Jensen, 1996), and landfills (Reichert, Small and Mohanty, 1992). The noted advantage from the existence of this extensive literature is in the existence of an established framework for estimating localized externality effects on residential property values. However, few studies consider the impact of commercial property development on residential property values. Yet, commercial development proposals arguably represent a very large component of policy debate in many jurisdictions across the nation, and NIMBY (not-in-my-backyard) is a recent addition to the modern vocabulary – even though it is not a recent concept.

Other studies discuss the political environment associated with commercial development proposals, including Feinerman, Finkelshtain and Kan (2004), Van der Horst (2007), and Schively (2007). The most closely related studies to the topic of a commercial development interaction tend to focus on the impact from very specific and niche products, such as Superfund sites (Kiel and Williams, 2007), livestock facilities (Herriges, Secchi and Babcock, 2005), oil and gas facilities (Boxall, Chan and McMillan, 2005), or new urbanism (Song and Knaap, 2003). This study aims to address the topic using a unified framework and consistent methodology to explore the outcome for surrounding residential property values resulting from new retail, office and industrial development for a major U.S. metropolitan market.

Hypothesis 1: *The delivery of new industrial development has no impact on surrounding residential property values.*

Industrial development, by comparison to the other two property types, is typically an unpopular land use, associated with increased pollution and trucking traffic. Industrial development is commonly horizontal on a single-story, rather than vertical, and the number of employees per square foot of building area is the lowest of the three commercial property types discussed in this proposal (e.g., typically 1 to 1.5 employees per 1,000 square feet of building area). Some industrial uses are resource-intensive and can place an excessive burden on the community's access to water and electricity.

Hypothesis 2: *The delivery of new office development has no impact on surrounding residential property values.*

New office development is typically the recipient of the highest property tax assessments (e.g., on both a value per square foot and value per acre basis). As a

consequence, new office buildings generally make positive contributions to a community's resources and infrastructure in excess of the resources absorbed. The disadvantage is that office buildings are highly-densified vertical land uses, increasing traffic flow and parking demand. Office buildings have also been accused of creating dark canyons or solar shadows as negative neighborhood externalities. If parking and traffic are not properly accommodated during the adjustments for development impact, then increased congestion will result as an undesirable consequence of new office construction. The advantage to office development is its ability to attract employers to the community who offer jobs in the business and professional services sectors. Residents seeking to minimize commute times may be attracted to neighborhoods that receive new office development.

Hypothesis 3: *The delivery of new retail development has no impact on surrounding residential property values.*

From a revenue perspective, retail development tends to be a jurisdictional favorite due to higher property tax assessments combined with additional cash flows sourced from local-option retail sales taxes. In the context of the surrounding housing market, whether retail development is net beneficial or detrimental depends on the outcome from competing effects. On the downside, new retail development often increases traffic volume, adds stress to public transportation systems, and attracts retail employees to the community who may seek low-income housing. A political argument is sometimes made to the effect that low-income residents decrease the quality of public education options. On the other hand, the quality and quantity of retail is commonly

ranked as one of the most desirable neighborhood attributes and new shopping and restaurants can attract residents to the community, increasing local housing demand.

If either the favorable or detrimental outcomes associated with any of the property types listed above are offset by the other, then Hypotheses 1, 2 or 3 will be rejected in favor of the alternative that commercial development of that property type *does* have a significant impact on the surrounding residential property values.

Summary of Data & Methods

This study combines market information from two important real estate events: new commercial real estate developments and single-family residential transactions. All empirical estimations in this study consider the values of single-family homes, as proxied by transaction prices. The series of residential transactions are for the metro Atlanta market area, generously provided by Georgia MLS, including a sample of 1,571,479 residential observations during the period 1985Q4-2014Q4. After deleting observations for listing status other than "Sold", transactions occurring under special sale conditions (e.g., foreclosure, short sale), homes under construction at time of sale, reported transaction prices of $0 or $1, homes reported to have zero bedrooms or zero bathrooms, and those with missing information about the date of sale, year built or listing price, the useable sample is reduced to 664,556 observations.

Longitude and latitude coordinates are necessary in order to evaluate the impact of residential transactions that occur in close proximity to new commercial development. However, the Georgia MLS data does not include information about the longitude and latitude of the property sold. To collect this information, the entire residential transaction

series is submitted through the Census Geocoder tool to convert property address to longitude-latitude coordinates. The Geocoder returns unavailable information for 53,971 observations (about 8 percent of the sample), further reducing the final sample to 610,585 observations.

Figure 1 shows the pattern of single-family residential home prices in the Atlanta metro and corresponding transaction volume over the period 1985Q4Q1 thru 2014Q4. During 2006-2007, average home prices in Atlanta peak over $230,000, approaching $250,000. By 2009Q1, the average home price was under $190,000 – down more than 24 percent from the peak. By 2014Q2, those losses had largely been recovered as home prices once again steadied with averages over $250,000. Transaction volume displays a high degree of seasonality, peaking in Q2 of every year. Over 16,000 transactions occurred during 2006Q2, and never more than 9,000 in any quarter during 2008 to 2012. While prices have recovered, transaction volume remains below the height of activity.

The specific focus of this research is to estimate the relative impact on housing values in close proximity to new commercial developments. The list of new commercial development projects includes industrial, office and retail property types, collected from the CoStar Property database – based on year of completion. In total, there were 193 industrial, 273 office and 467 retail projects completed since 2006 in the Atlanta metro area.

Figure 2 shows the commercial development completions over a time series. Industrial development accounts for the largest amount of total space delivered at over 26.6 million square feet, with nearly one-third of that delivered during 2006 alone. Industrial deliveries drop to around 1 million square feet per year during the five year

period from 2009 to 2013; although it appears to have begun a sharp comeback by 2014. By comparison, office and retail development fall to near extinction during 2009 to 2013. All three categories of commercial real estate development display dramatic cyclic behavior.

Figure 3 presents the breakdown of new commercial developments by property type, sub-type and project size. For industrial, warehousing facilities represent the greatest number of new projects (in project count observations). Distribution centers constitute the second largest category, and are generally larger projects (typically over 75,000 square feet). Office buildings are often designed with flexibility to accommodate a variety of possible tenants, and general purpose office buildings represent the largest portion of new product. Medical office buildings are typically smaller (less than 50,000 square feet) and represent the second largest component of new office development. The largest category of new retail development observations is general retail, second is strip centers, and third is neighborhood shopping centers. The number of observations for new retail development types is inversely proportionate to shopping center size.

CoStar data already includes longitude-latitude coordinates for each new delivery. Using these coordinates, the relative distance between each development site and every residential transaction in the sample is calculated in nautical miles (measuring distance "as the crow flies") using the haversine formula and solving for distance:

$$\text{Distance} = 2r \cdot \arcsin\left(\sqrt{\sin^2\left(\frac{\phi_2-\phi_1}{2}\right)+\cos(\phi_1)\cos(\phi_2)\sin^2\left(\frac{\lambda_2-\lambda_1}{2}\right)}\right),$$

where ϕ_1 and ϕ_2 are the latitudes, and λ_1 and λ_2 are the longitudes of points 1 and 2. r is the radius of the earth: 3963.17 miles. The distance measures are used to create the Close

indicator variable, identifying residential transactions that occur within the following radii of a new commercial development: .5 mile, .75 mile, and 1 mile. The objective is to identify relative valuation effects for the surrounding residential area pre- vs. post-completion. Observations located within radius of more than one new development for a commercial property type are removed from the analysis.

Table 1 describes the sample of residential transactions. The average home is 27 years old and sold for over $202,000. The most common home sold has three bedrooms (47 percent of the sample), two bathrooms (65 percent of the sample), and no half-bath (55 percent of the sample). Properties located close to new industrial developments are significantly lower priced (average price of $134,000), as are those close to new retail development (average price of $164,000). By comparison, homes close to new office development are more expensive (average price of $223,000).

To provide a more careful comparison, this study utilizes a matched sample methodology whereby for each Close transaction observation, a matched sample is constructed for transactions of "comparable" properties that are sold in the same calendar quarter, located in the same zip code (but outside the radius), having the same number of bedrooms, same number of bathrooms, and constructed within five years of the Close observation. All properties are single-family detached and sold under normal sale conditions. On average, each observation of a Close transaction corresponds to a matched sample comprised of seven to nine comparables. Observations that do not have at least one comparable transaction are excluded from the analysis.

Observations that are neither identified as Close, nor comparable are omitted from the respective estimation. In doing so, the empirical findings relate the percentage

difference in transactions prices for Close properties relative to comparable properties sold in the same quarter and zip code only – but outside the radius for development impact. The specification is akin to a difference-in-difference approach, attempting to compare effects for the subject group of observations close to a new development to effects for a control group of highly similar observations. The comparison is made at all possible points in time, before and after the development completion. In doing so, the technique attempts to resolve concerns that new commercial developments are neither randomly assigned to submarkets nor evenly distributed over a time series, and instead may respond to locally endogenous conditions such as population and economic growth.

The appropriateness of this method relies on its underlying assumptions. First, it assumes that neighborhood characteristics do not differ significantly between the area depicted by the radius that receives the new development and area in the same zip code that does not. Second, it assumes that the trend in property values beyond the radius but in the same zip code are representative of the trend in property values that would have occurred inside the radius had commercial development activity not taken place. The empirical analysis evaluates both assumptions by measuring the trend within the radius relative to comparable properties in the remaining zip code before development, after development, as well as counterfactually – supposing no development.

A hedonic model is used to specify valuation effects, which assumes that the value of a property is a function of physical, financial, locational, and market timing attributes. The basic model to be estimated is written as:

$$\ln(\text{Sale price}) = \beta_0 + \beta_1 \cdot \ln(\text{Age}) + \beta_2 \cdot 1 \text{ bedroom} + \beta_3 \cdot 2 \text{ bedrooms} + \beta_4 \cdot 4 \text{ bedrooms} + \beta_5 \cdot >4 \text{ bedrooms} + \beta_6 \cdot 1 \text{ bathroom} + \beta_7 \cdot 3 \text{ bathrooms} + \beta_8 \cdot 4 \text{ bathrooms}$$

$$+\beta_9 \cdot >4 \text{ bathrooms } +\beta_{10} \cdot 1 \text{ half-bath } +\beta_{11} \cdot 2 \text{ half-baths } +\beta_{12} \cdot >2 \text{ half-baths}$$
$$+\beta_{13} \cdot \text{Close} +\beta_{14} \cdot \text{Close*After} +\beta_{15} \cdot \text{Close*After*Trend}$$
$$+\sum_{i=1}^{15} \beta_{t+16} \cdot \text{Financing}_i +\sum_{j=1} \beta_{j+31} \cdot \text{Zip-quarter}_j +\varepsilon. \quad (1)$$

The dependent variable is the transaction price, logged. Variables measuring the physical characteristics include property Age, logged, along with indicator variables for the number of bedrooms, bathrooms and half-baths. Indicators for 3 bedrooms, 2 bathrooms, and 0 half-baths are suppressed – representing the largest categories and to avoid multicollinearity. Financing conditions are controlled through 15 indicator variables (e.g., all cash, conventional, 100 percent financing, seller financing). Time-varying differences in market conditions are controlled through calendar-quarter indicator variables for each zip code, represented by the Zip-quarter_j variables. This approach allows intra-market dispersion in real estate cycles and seasonality to be controlled at the zip code level.

The Close variable is an indicator for transaction observations located within the specified radius. After is an indicator variable for transactions that occur in the year following completion of a new commercial development. Trend measures years relative to development completion, {-20,-19,…,-1,0,+1, …,+8}, where 0 represents the year of completion. Given the log-linear and fixed-effects model specification, the parameter estimates for β_{13}, β_{14}, and β_{15} are the central focus of this estimation. The β_{13} coefficient (for Close) measures the constant pricing difference for observations within the radius relative to the remaining zip code over the full horizon. The β_{14} coefficient (for the Close*After interaction term) measures the constant change in the basis spread for the radius following the completion of a new development. The β_{15} coefficient (for the Close*After*Trend interaction term) measures the change per year in the trend for the radius relative to the remaining zip code following the completion of a new development.

A potential issue with the specification of Equation (1) is that the difference in property values within the radius relative to the remaining zip code may not be constant leading up to the development; rather values may be either relatively increasing or decreasing over time. In addition, the trend may have changed recently, altering the favorableness of conditions for development inside the radius. To evaluate these issues, two spline variables are added to the model. Equation (2) simply includes these two additional variables.

$$\begin{aligned}\ln(\text{Sale price}) = {} & \beta_0 + \beta_1 \cdot \ln(\text{Age}) + \beta_2 \cdot 1 \text{ bedroom} + \beta_3 \cdot 2 \text{ bedrooms} + \beta_4 \cdot 4 \text{ bedrooms} \\ & + \beta_5 \cdot >4 \text{ bedrooms} + \beta_6 \cdot 1 \text{ bathroom} + \beta_7 \cdot 3 \text{ bathrooms} + \beta_8 \cdot 4 \text{ bathrooms} \\ & + \beta_9 \cdot >4 \text{ bathrooms} + \beta_{10} \cdot 1 \text{ half-bath} + \beta_{11} \cdot 2 \text{ half-baths} + \beta_{12} \cdot >2 \text{ half-baths} \\ & + \beta_{13} \cdot \text{Close} + \beta_{14} \cdot \text{Close*After} + \beta_{15} \cdot \text{Close*After*Trend} + \beta_{16} \cdot \text{Spline 1} + \beta_{17} \cdot \text{Spline 2} \\ & + \sum_{i=1}^{15} \beta_{t+18} \cdot \text{Financing}_i + \sum_{j=1} \beta_{j+33} \cdot \text{Zip-quarter}_j + \varepsilon. \end{aligned} \quad (2)$$

Spline 1 is the same as the Trend variable, measuring years relative to development completion for observations inside the radius, {-20,-19,…,+8}, although not interacted with the After variable. Spline 1 measures the overall trend, or change in prices, within the radius relative to the remaining zip code – this measure is naïve with regard to development effects. Spline 2 is the same as the Trend variable, but interacted with an indicator variable for transactions that occur within five years prior to completion and beyond. Thus, Spline 2 introduces a knot-point in the trend line at -5 years relative to completion, and the Trend*After interaction term introduces a third knot-point at year +1 following completion. The coefficient on Spline 2 reveals whether the overall trend has changed recently in the pre-development period. The coefficient on the Trend*After interaction term is then measured relative the counterfactual trend implied by Spline 2. The spline regression approach, zip-quarter fixed effects, and exclusion of all remaining

market data that is not in the same zip code is consistent with the methodology applied by Ellen, Schill, Susin and Schwartz (2001), who evaluate development impacts of subsidized owner-occupied housing in New York City. The empirical results for the .5, .75 and 1 mile radii for industrial, office and retail property types are discussed in the next section.

Discussion of Results

Table 2 presents results from estimation of the base model, considering the relative impact on residential transactions within a .75 mile radius of new industrial, office, and retail developments in three separate estimations. The estimation is a fixed effects model, controlling for differences across Atlanta submarkets (defined by zip code) at the quarterly frequency. The estimated coefficient for Age is negative and significant; property values depreciate with age. Property values are generally increasing in the number of bedrooms, bathrooms and half-baths. The bedroom and bathroom coefficients are relatively large because they serve as proxies for the property size, since square footage is unavailable in the Georgia MLS data. Other studies tend to report lower estimated coefficients after controlling for property size. For conciseness, the estimated fixed-effect coefficients for Financing type and Zip-quarter indicator variables are unreported.

For new industrial developments, there were 4,272 transaction observations within a .75 mile radius over the sample period with at least one comparable observation that occurred outside the .75-mile radius, yet in the same zip code and calendar quarter. The 4,272 Close transactions along with the 34,191 observations of comparable

transactions appear in 1,350 distinct zip code-quarters. The coefficient for Close is estimated to be -0.01 and significant at the 10 percent level. Properties inside the .75 mile radius sell at a discount of 1 percent over the sample period, independent of the new development. This result suggests that neighborhood characteristics may vary to a limited extent for areas targeted for new industrial development. The coefficient for the Close*After interaction term is estimated at -0.044, and the coefficient for the Close*After*Trend variable is estimated to be -0.007. Following completion of a new industrial development, residential properties in the .75 mile radius are discounted an additional 4.4 percent relative to comparable properties outside the radius but inside the same zip code, and the discount widens by 0.7 percent per year following completion. This interpretation relies on the assumption that the basis difference in valuation for property values within the radius is constant and does not change over time – an assumption that is found to be inappropriate (discussed in results for Table 3).

For new office development, the estimated effect is zero. The 7,520 residential transactions that occur within the .75 mile radius of new office development are not sold at a significantly different price relative to the 51,505 transactions of comparable properties that are sold in the zip code and quarter, but located outside the radius. There is no significant difference in prices before or after the office development is completed, and no change in the trend for residential prices within the radius relative to prices outside the radius.

New retail development generally follows residential growth, and there is a much higher concentration of single-family transactions within the .75 mile radius. Properties inside the radius are discounted 2.3 percent relative the surrounding zip code. The

discount drops sharply following the new development, estimated at a 4.5 percent reduction, but prices subsequently rise by 1.3 percent per year relative to comparables outside the radius following the completion of the new development. If prices inside the radius are discounted 2.3 percent with no development, prices are discounted 5.5 percent in the year following development completion, 4.2 percent two years after, 2.9 percent after three years, and 1.6 percent after four years. Thus, the completion of new retail development has a negative impact in the immediate-term that is subsequently offset over a relatively short horizon. By the fourth year following completion of a new retail development, prices inside the radius are higher relative to outside the radius than they were pre-development and steadily increasing.

Table 3 presents a more complete evaluation of development effects. Recall the finding of negative post-development effects for the .75 mile radius following industrial completions. However, when the spline variables are included in the estimation, the coefficients for Close*After and Close*After*Trend are no longer significant, while the estimated coefficient for Spline 2 is negative and significant. This suggests that property values within the .75 mile radius had already begun to decline at a rate of 1.3 percent per year, and that the timing of the new industrial completion had no significant impact on this pace of decline. The same result obtains for the new industrial developments at the 1 mile radius.

Figure 4, Panel A illustrates the pattern for property values inside the .75 mile radius relative to a new industrial completion. During years -20 to -6 relative to the project completion, values within the radius experience a trivial (and insignificant from zero) decline relative to values outside the radius. Five years prior to the new industrial

development, there is a significant change in the trend with values inside the radius being temporarily 4 percent higher, but falling at a rate of 1.3 percent per year. The dashed line depicts the counterfactual projection for what would have occurred following this new trend. The actual change in trend following new industrial development is insignificant from the existing trend. That is, while property values are found to have declined following a new industrial completion, the direction and magnitude of the decline are consistent with what would have been expected for the area had no development activity occurred.

Results for new office development are also provided in Table 3. Inclusion of the spline variables reveals that property values inside the .75 mile radius for new office development are relatively higher valued than their outside radius counterparts, estimated at a location premium of 2.1 percent for the Close variable. During the five-year pre-development horizon, a positive trend appears within the radius with values appreciating 0.8 percent per year. In the period following the office development completion, the price appreciation trend reverts to zero (estimated coefficient of -0.008 for Close*After*Trend effectively cancels out coefficient of equal and opposite magnitude for Spline 2). This result is illustrated in Figure 4, Panel B. Sites selected for new office development are located in relatively higher priced residential neighborhood which had begun to experience an upward trend in prices. While prices inside the radius remain relatively higher in the post-development period, they are neither significantly different from pre-development values, nor appreciating at a rate that is significantly different from zero.

Findings for the impact of new retail development are largely unaffected by the addition of the spline variables, as shown in Table 3. New retail development occurs in

neighborhoods with significantly lower property values, estimated at 2.8 percent below comparable properties for the .75 mile radius. Following the completion of a new development, the initial impact is negative 2.5 percent (net of coefficients for Close*After and Close*After*Trend), followed by positive annual price appreciation at a rate of 1.5 percent. Figure 4, Panel C illustrates the impact of retail development on surrounding residential property values for the .75 mile radius. Properties close to the development site are discounted relative to similar properties that are outside the radius. Following completion of a new retail development, the basis drops but price appreciation adjusts sharply upward. The initial negative price impact following completion of a new retail development is more than offset by positive gains after a few years. Over a longer horizon, residential properties in the area targeted for new retail development ultimately sell at a significant premium to those located outside the radius.

In Table 3, the sensitivity of the results with respect to the choice of radius is provided. Choosing a narrowly-specified radius (such as .5 mile) establishes a more direct connection between the new commercial development and immediately surrounding property values, but the empirical test has less power since there are fewer transactions in a given period for the smaller radius. Table 3 illustrates this tradeoff. The volume of transactions in the 1 mile radius is considerably higher than the transaction volume in the .5 mile radius, leading to more accurate parameter estimates. However, observations that are 1 mile away from the new development are less likely to be as directly affected by the completion as observations that are within the .5 mile radius.

Comparing results across the select radii for industrial, the Spline 2 and Close coefficients are negative and increase in magnitude with proximity to the development

site. At the .5 mile radius, property values are lower by 5 percent, compared to 3.5 percent for the .75 mile radius and 2.5 percent for the 1 mile radius. The downward trend that begins in the predevelopment period is most acute for properties closest to the development site. Five years before development completion, property values begin to decline by 1.9 percent per year in the .5 mile radius, 1.3 percent in the .75 mile radius, and 0.5 percent in the 1 mile radius. These findings suggest that locally depressed and relatively declining property values are likely influence by proximity to the development site, although the impact is less likely a result of the project completion and more likely a consequence of events that occur during the predevelopment phase – such as zoning changes, project approval or entitlement (however these issues are not directly tested in this study).

Discussion of Policy Implications

The comprehensive approach adopted in this research study considers office, retail and industrial under a consistent framework and evaluates the impact of new commercial development for Atlanta, Georgia – a major U.S. metropolitan market. The results have the potential to be generalized to a broader audience, although some limiting factors should be noted. First, Georgia MLS data has some limitations including the lack of a square footage measure, which should increase the accuracy of the residential pricing estimation. Second, CoStar Market Reports provide information on select major developments, which typically includes the largest and most visible projects. However, there may be confounding factors that bias the results, including the presence of unobserved new developments or other unobservable factors. Third, this study makes use

of a matched sampling methodology which does not include the maximum data available, although alternative methods may be considered such as analysis of the full sample. Matched samples increase the precision of the comparison between subject and control group observations at the expense of lower statistical power (due to fewer observations). The results are noticeably sensitive with respect to choice of radius and matching criteria. Fourth, this study considers the Atlanta metro area, which is characterized by relatively loose permitting and entitlement. In unrestrictive markets, development impact fees may be insufficient to offset the actual impact from a community stakeholder perspective. Future research may consider more restrictive markets and compare the long-horizon impacts. Finally, the nature of the research question attempts to relate the occurrence of new commercial developments to changes in surrounding residential property values, although the connection between the two series may be indirect at best due to the time required for development externalities to be fully incorporated in housing values. Over a long horizon many factors can enter the picture which will affect property values, including changes in market conditions. In addition, the association becomes increasingly indirect as the distance between the residential observation and the development site increases. Notably, much of the commercial development activity occurred pre-2008, just before the Atlanta housing market experienced a significant downturn. Even though the empirical analysis attempts to account for these changes, post-development horizons are heavily comprised of observations from depressed market conditions.

This study applies a novel methodology for evaluating the impact of commercial development on surrounding residential property values, and this approach may serve as a foundation for future studies that investigate issues related to commercial development

externalities. It is possible that the findings are referenced in ongoing media discussion and policy debates at jurisdictional permitting and entitlement hearings as evidence in favor of or against new development proposals. From a legal standpoint, communities often seek development impact fees which invoke rational nexus and rough proportionality yardsticks. *Ex ante*, it can be very difficult to predict the actual impact that a singular new commercial development will cause. *Ex post*, industrial developments coincide with a preexisting downward trend in local housing values, yet the completion of an industrial development does not have a significant impact on the trend (at the .75 mile radius). Residential property values near office development sites experience an effect that essentially nets to zero upon completion. Retail developments, by comparison, have a positive and significant impact that differs from the existing trend – albeit over a longer horizon.

Perhaps most surprising is the lack of evidence for negative and significant impacts of commercial real estate development on residential property values. Volumes of political arguments to the contrary are voiced at local planning debates across the nation, yet this study does not provide substantive evidence of a negative interaction.

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Tables & Figures for Empirical Results

Table 1. Sample of Single-family Residential Transactions

Table 2. Base Model

Table 3. Results by Distance, Spline Regressions

Figure 1. Atlanta Home Prices & Transaction Volume, 1985Q4-2014Q4

Figure 2. Commercial Real Estate Developments, 2006-2018

Figure 3. Sample of Commercial Developments, by Property Size & Category

Figure 4. Estimated Price Impact following New Commercial Development

Table 1. Sample of Single-family Residential Transactions

	Close to Industrial			Close to Office			Close to Retail			Full
Radius	*.5 mile*	*.75 mile*	*1 mile*	*.5 mile*	*.75 mile*	*1 mile*	*.5 mile*	*.75 mile*	*1 mile*	**Sample**
Observations	1,880	4,272	6,220	4,324	7,520	10,438	9,993	15,335	15,287	664,556
Variable	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean
Close	1	1	1	1	1	1	1	1	1	
Sale Price	$133,975	$129,485	$132,969	$222,778	$207,350	$188,234	$163,976	$161,183	$159,523	$202,014
Age	17.931	17.901	18.310	23.350	21.058	18.836	20.823	19.527	17.788	27.164
1 bedroom	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
2 bedrooms	0.029	0.040	0.032	0.044	0.035	0.025	0.031	0.023	0.023	0.031
4 bedrooms	0.260	0.257	0.265	0.306	0.308	0.329	0.275	0.300	0.306	0.348
>4 bedrooms	0.054	0.042	0.038	0.105	0.094	0.086	0.061	0.062	0.064	0.149
1 bathroom	0.118	0.147	0.126	0.089	0.074	0.067	0.113	0.114	0.105	0.059
3 bathrooms	0.122	0.108	0.102	0.202	0.177	0.163	0.137	0.149	0.149	0.210
4 bathrooms	0.018	0.008	0.005	0.062	0.051	0.038	0.026	0.022	0.025	0.063
>4 bathrooms	0.001	0.000	0.000	0.012	0.009	0.008	0.006	0.004	0.005	0.021
1 half-bath	0.420	0.426	0.418	0.437	0.458	0.475	0.384	0.404	0.408	0.434
2 half-baths	0.003	0.003	0.003	0.009	0.010	0.011	0.006	0.007	0.008	0.012
>2 half-baths	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.001	0.001
Matched samples										
	.5 mile	*.75 mile*	*1 mile*	*.5 mile*	*.5 mile*	*1 mile*	*.5 mile*	*.75 mile*	*1 mile*	
Observations	16,282	34,191	52,935	29,840	51,505	82,457	89,918	122,661	112,041	
Variable	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	
Close	0	0	0	0	0	0	0	0	0	
Sale Price	$140,456	$139,831	$141,037	$184,627	$174,039	$164,181	$152,740	$153,036	$151,758	

Notes: Table 1 presents summary statistics for the full sample of single-family residential transactions, along with the subsamples that are located in close proximity to new industrial, office and retail developments based on .5, .75 and 1 mile radii from the development site. Commercial developments are identified using the CoStar Property database for the period 2006-2014. During this period, there were 193 new industrial developments, 273 new office developments, and 467 new retail developments identified for the Atlanta (GA) metropolitan area. Residential transaction data are for the period 1985Q4-2014Q4 from the GA MLS database. Geographic distance is calculated in nautical miles based on longitude-latitude coordinates of the new commercial development and each residential transaction. The Observations row reports the number of residential transactions in the full sample and respective subsamples. The bottom panel reports the mean Sale Price and number of Observations for the matched samples of transactions that occur in the same calendar quarter and zip code as an observations located inside the specified radius, and have the same number of bedrooms, same number of bathrooms and were constructed within five years of the property that is inside the radius.

Variable definitions: Close is an indicator variable for observations that are located within the respective .5, .75 or 1 mile radius of a commercial development site, taking on a value of one for location inside the radius and zero otherwise. Sale Price is the transaction price paid at closing (in USD). Age measures the difference between the sale year and the year the residential single-family home was constructed. The 1, 2, 3, 4 and >4 bedroom [bathroom] variables are indicators for the number of bedrooms, taking on a value of one of the transaction was for a home that included a number of bedrooms [bathrooms] matching that category, and zero otherwise. Similarly, 0, 1, 2, and >2 half-bath variables are indicators for the number of half-bathrooms. Transactions reporting zero bedrooms or zero bathrooms are not considered in this sample.

Table 2. Base Model

Radius: .75 mile	**Industrial**		**Office**		**Retail**	
Variable	Coefficient	(*t*-stat)	Coefficient	(*t*-stat)	Coefficient	(*t*-stat)
Constant	12.217***	(60.7)	11.481***	(65.6)	11.252***	(59.4)
log(Age)	-0.133***	(-37.2)	-0.145***	(-46.8)	-0.143***	(-81.5)
1 bedroom			-0.276	(-1.1)	-0.258	(-1.3)
2 bedrooms	-0.071***	(-3.8)	-0.029	(-1.6)	-0.120***	(-10.3)
4 bedrooms	0.124***	(25.1)	0.116***	(26.9)	0.127***	(51.5)
>4 bedrooms	0.179***	(12.3)	0.173***	(17.7)	0.176***	(27.7)
1 bathroom	-0.258***	(-26.7)	-0.393***	(-33.4)	-0.313***	(-58.2)
3 bathrooms	0.249***	(30.0)	0.273***	(46.0)	0.252***	(70.9)
4 bathrooms	0.568***	(19.4)	0.623***	(49.7)	0.600***	(58.1)
>4 bathrooms	0.839***	(6.0)	0.792***	(23.8)	0.803***	(29.8)
1 half-bath	0.161***	(47.3)	0.187***	(63.9)	0.200***	(113.8)
2 half-baths	0.212***	(8.4)	0.367***	(24.2)	0.345***	(35.8)
>2 half-baths	-0.017	(-0.2)	0.292***	(4.0)	0.439***	(11.7)
Close	-0.010*	(-1.9)	0.007	(1.5)	-0.023***	(-8.6)
Close*After	-0.044**	(-2.4)	0.020	(1.3)	-0.045***	(-4.4)
Close*After*Trend	-0.007*	(-1.7)	0.000	(0.0)	0.013***	(6.0)
Financing indicators:	Included [15]		Included [15]		Included [15]	
Zip-quarter indicators:	Included [1350]		Included [2217]		Included [2834]	
R^2	76.9%		74.0%		75.5%	
Observations	38,463		59,025		137,996	

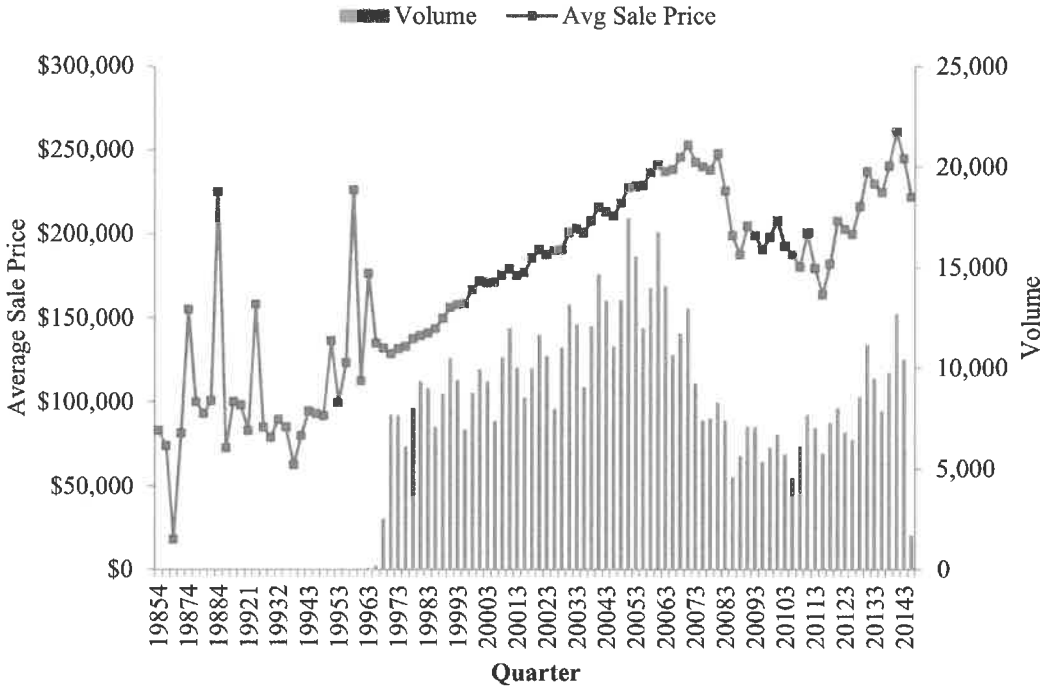
Notes: This table presents the results from three least squares estimations of Equation (1). The dependent variable is Sale Price, logged, which is the transaction price for each residential property in the sample. Close is an indicator variable for residential transactions that occur within the specified radius (.75 miles) of any new commercial real estate development during the sample period. Results for industrial, office and retail developments are presented in separate estimations, including the estimated Coefficient and corresponding *t*-statistic (*t*-stat) in parentheses. The interaction term Close*After is an indicator variable for residential transaction that occur within the specified radius and after the development project is completed. The interaction term Close*After*Trend takes on positive values counting the year since project completion for observations inside the radius that occur in the post-completion period, and values of zero otherwise. The estimations also include 15 indicator variables for transaction-specific financing conditions, as well as zip code-calendar quarter fixed effect indicators controlling for (unreported) geographic time-varying differences of the housing market. All other variables are defined in the notes to Table 1. The following variables are suppressed to prevent a linear combination: 3 bedrooms, 2 bathrooms, and 0 half-bath. ***, **, and * indicate statistical significance of estimated coefficients at the 1%, 5% and 10% levels of confidence respectively.

Table 3. Results by Distance, Spline Regressions

Radius:	*.5 mile*		*.75 mile*		*1 mile*	
Equation:	(1)	(2)	(1)	(2)	(1)	(2)
Panel A. Industrial	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Close	-0.015 **	-0.050 ***	-0.010 *	-0.035 ***	-0.006	-0.025 ***
Close*After	-0.117 ***	-0.082 ***	-0.044 **	-0.017	-0.017	0.002
Close*After*Trend	0.005	0.024 ***	-0.007 *	0.006	-0.007 **	-0.002
Spline1		-0.003		-0.002		-0.003 ***
Spline2		-0.019 ***		-0.013 ***		-0.005 *
R^2	79.0%	79.0%	76.9%	76.9%	72.0%	72.0%
Observations	18,162		38,463		59,155	
Panel B. Office	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Close	0.003	-0.009	0.007	0.021 **	0.000	0.007
Close*After	0.019	0.031	0.020	0.005	0.015	0.007
Close*After*Trend	-0.003	-0.005	0.000	-0.008 *	-0.002	-0.008 **
Spline1		-0.005 ***		0.001		-0.001
Spline2		0.002		0.008 **		0.006 **
R^2	74.8%	74.8%	74.0%	74.0%	75.7%	75.7%
Observations	34,164		59,025		92,895	
Panel C. Retail	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Close	-0.021 ***	-0.030 ***	-0.023 ***	-0.028 ***	-0.031 ***	-0.048 ***
Close*After	-0.043 ***	-0.034 **	-0.045 ***	-0.040 ***	-0.035 ***	-0.019 *
Close*After*Trend	0.013 ***	0.017 ***	0.013 ***	0.015 ***	0.013 ***	0.019 ***
Spline1		-0.001		-0.001		-0.002 ***
Spline2		-0.004		-0.001		-0.006 ***
R^2	74.5%	74.5%	75.5%	75.5%	76.8%	76.8%
Observations	99,911		137,996		127,328	

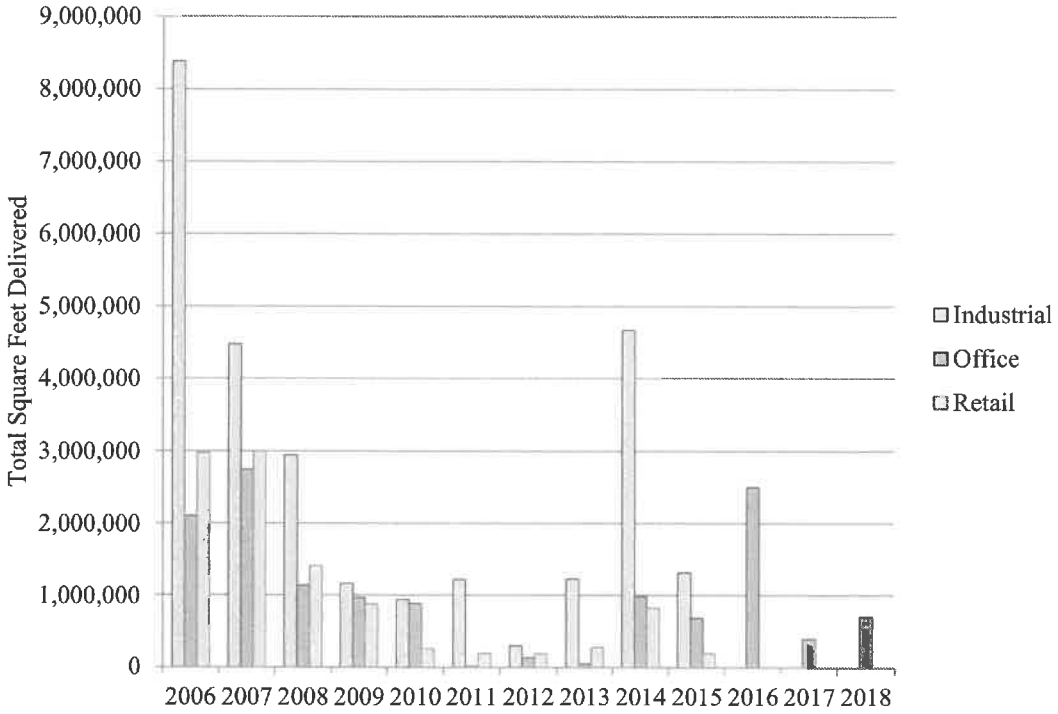
Notes: This table presents the results from the least squares estimations of Equations (1) and (2). The dependent variable is Sale Price, logged, which is the transaction price for each residential property in the sample. D_Close is an indicator variable for residential transactions that occur within the specified radius (.75 miles) of any new commercial real estate development during the sample period. Results for industrial, office and retail developments are presented in separate estimations, including the estimated Coefficient and corresponding *t*-statistic (*t*-stat) in parentheses. The interaction term Close*After is an indicator variable for residential transaction that occur within the specified radius and after the development project is completed. The interaction term Close*After*Trend takes on positive values counting the year since project completion for observations inside the radius that occur in the post-completion period, and values of zero otherwise. Spline 1 measures the year relative to development completion over the full horizon (i.e., beginning with year -20 thru year +8) for all observations inside the radius, while Spline 2 measures year relative to completion beginning in year -5, and takes on a value of zero for earlier years and for observations outside the radius. The estimations also include 15 indicator variables for transaction-specific financing conditions, as well as zip code-calendar quarter fixed effect indicator variables controlling for (unreported) geographic time-varying differences of the housing market. All other variables are defined in the notes to Table 1. The following variables are suppressed to prevent a linear combination: 3 bedrooms, 2 bathrooms, and 0 half-bath. ***, **, and * indicate statistical significance of estimated coefficients at the 1%, 5% and 10% levels of confidence respectively.

Figure 1. Atlanta Home Prices & Transaction Volume, 1985Q4-2014Q4



Notes: Figure 1 illustrates the average single-family residential transaction prices per quarter in the sample, during the period 1985Q4 to 2014Q4, using the blue line and corresponding to values on the left axis. Over the same period, the time-series distribution of residential transaction volume is depicted quarterly by the black bars, corresponding to values on the right axis.

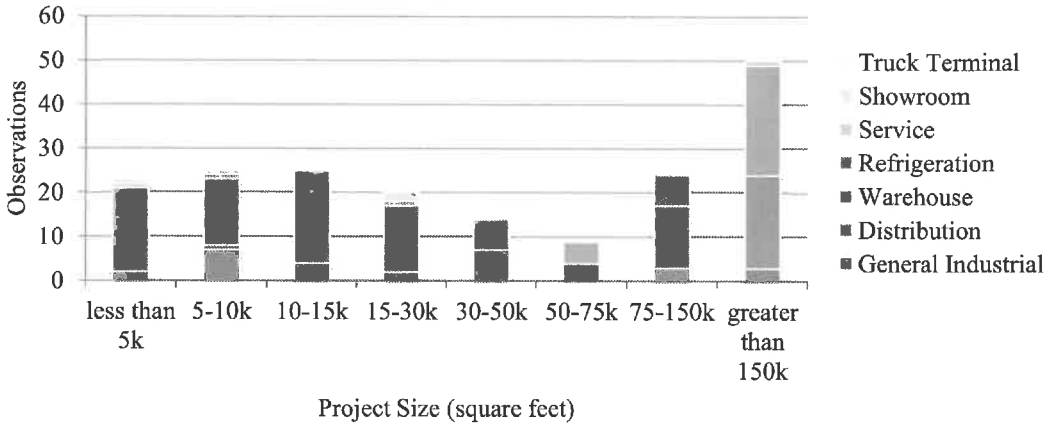
Figure 2. Commercial Real Estate Developments, 2006-2018



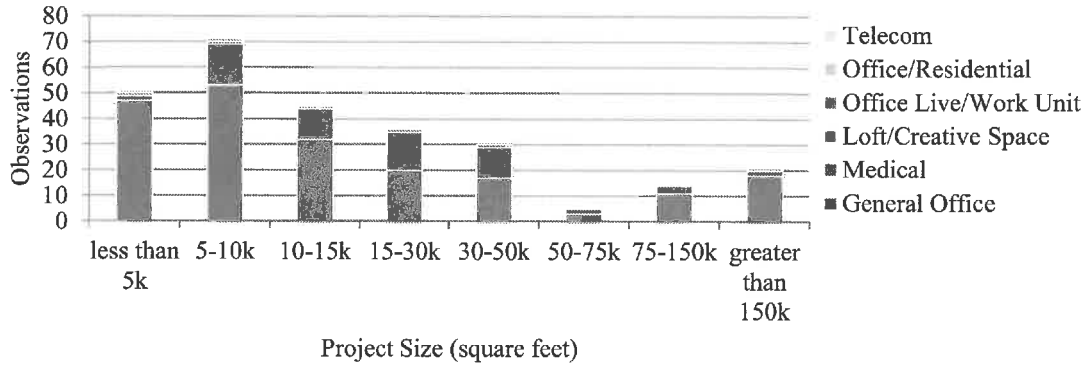
Notes: Figure 2 illustrates the time-series distribution of total square footage of new commercial real estate projects delivered annually, by property type, over the period 2006 to 2018 (using expected values for the period 2014 thru 2018). Industrial space delivered is represented by the green bars, office space by the blue bars, and retail by the orange bars.

Figure 3. Sample of Commercial Developments, by Property Size & Category

A. Sample of Industrial Developments



B. Sample of Office Developments



C. Sample of Retail Developments

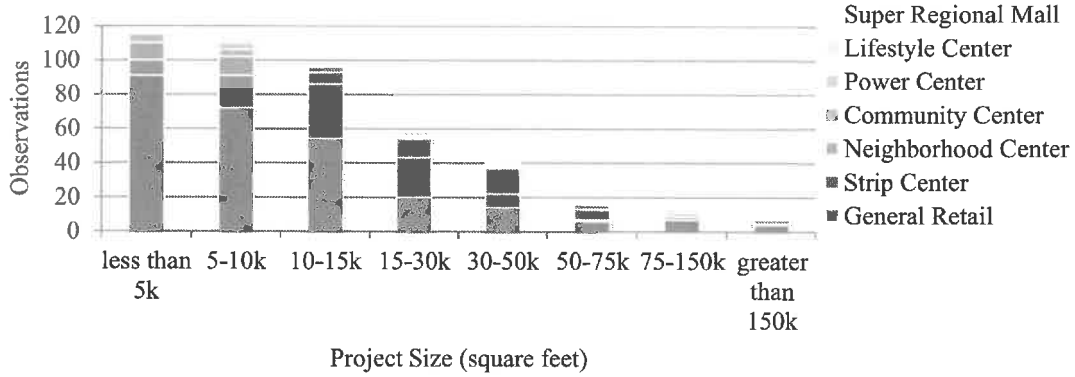
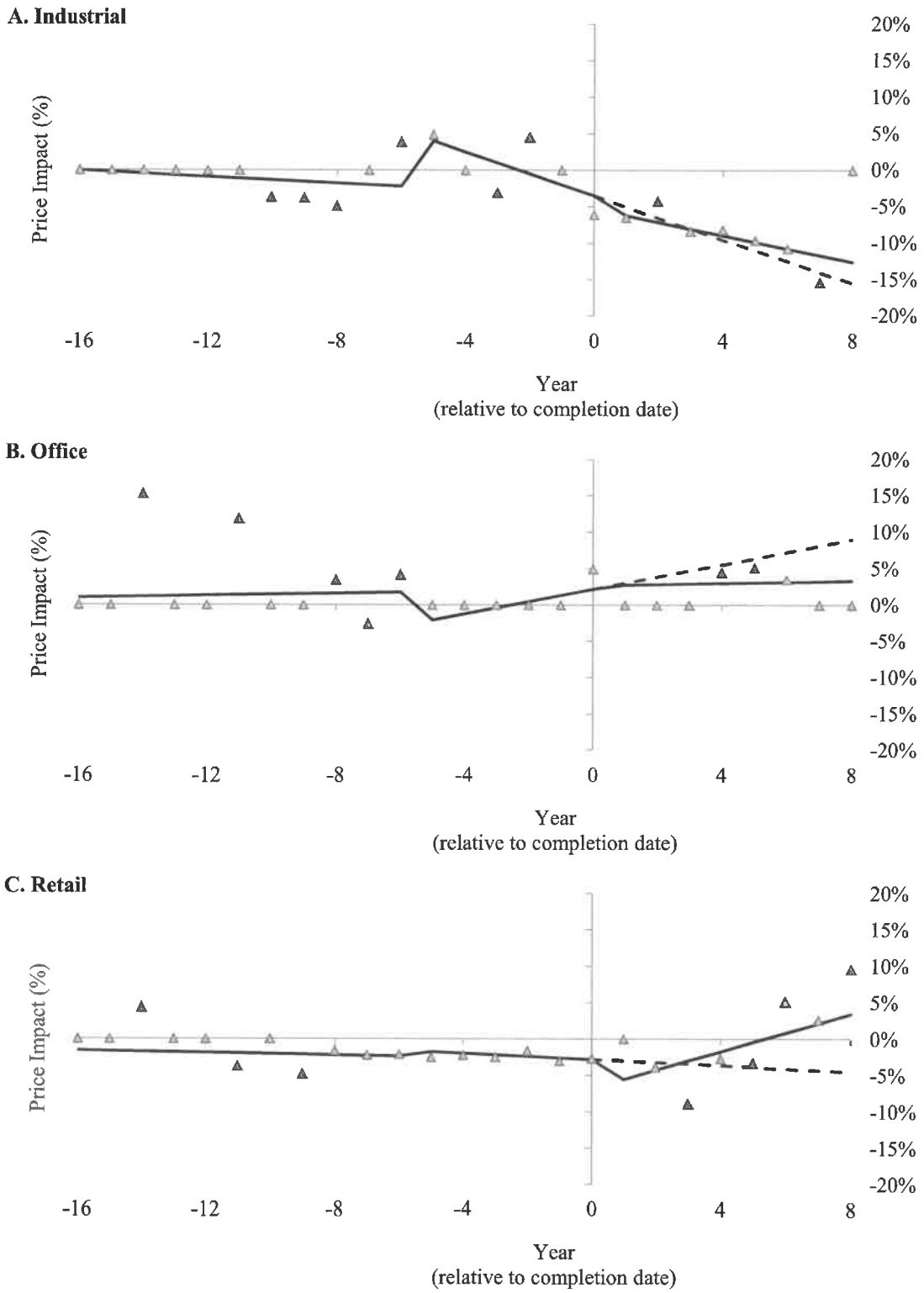


Figure 4. Estimated Price Impact following New Commercial Development



Notes: This figure presents the estimated price impact for single-family residential properties located within a .75 mile radius of a new industrial development (Panel A), office development (Panel B), and retail development (Panel C). Price impact is measured relative to a matched sample of single-family residential properties that have the same number of bedrooms, the same number of bathrooms, are built within 5 years, located in the same zip code (but outside the radius) and sold in the same calendar quarter of at least one subject property inside the radius. The grey triangles represent the estimated coefficients for each relative year interaction term for properties located inside the radius. Grey triangles take on a value of zero for coefficients that are statistically insignificant from zero at the 10% level. The solid black line depicts the trend from the spline regression with breakpoints at the -5 and +1 years relative to project completion. The dashed black line represents the counterfactual trend that would have been expected to occur for the .75 mile radius had the development not occurred.

SECTION #2

Similar Uses

ITEM #2

Whether the Proposed Use is Similar to Other Uses in the Area

The proposed use of the subject property is similar to other uses in the area. Basically, we are creating a vacation home destination, not unlike numerous homes located on County Hwy B and other nearby properties. Again, the only difference is that homeowners in the development will be a Class A Motorcoach enthusiast.

Supporting our position of the above statement –

- Subject property is zoned Recreation Commercial (RC). In reviewing the RC classification along CTY HWY B and within a 2.5 mile radius of the subject property, there are 31 parcels of property consisting of 394.89 acres of the same zoning classification.

- There are 12 parcels of property consisting of 22.65 acres of High Density (HD) within 2 miles of the subject property.

- There are several nearby properties located on CTY Hwy B with higher densities that cater to transient tourists. Bayshore Inn, Westwood Shores, Birmingham Bar and Cottages, Andropolis Cottages, are examples.

- The adjacent park and boat launch is a recreation facility with the intent of providing public activities that complement the proposed development and confirms the development is an appropriate fit for the area.

- There is at a minimum 38 single family homes and cottages located near the subject property that are being rented out, via online rental services. In one specific case, the maximum capacity is being advertised at 14 occupants.

- Size of lots. There are numerous lots on CTY HWY B that have lot widths of 80 ft. Obviously, these lots being substandard, and not meeting minimum lot widths for SF 20 were grandfathered many years ago. Many of those lots are similar to lot sizes being proposed.

- The actual density of our development is similar to other densities in the area. We are proposing 115 single family homes at full build-out. Assuming full build-out is obtained, and, knowing that the total subject property is 57.02 acres, this calculates to one home per 21,500 sq ft -- which is by definition is a SF20 lot. As can be seen on the attached zoning map, almost all lots located on Cty Hwy B are zoned SF20.

- Demographics of buyers in the development will be similar to other property owners in the immediate area. Most buyers will be in the 55-75 age group, with less than 2% under the age of 35.

SECTION #3

Comprehensive Plan

Item #3

Whether the Proposed Project is Consistent with the Door County Comprehensive and Farmland Preservation Plan or Any Officially Adopted Town Plan

The proposed development is consistent with the Door County Comprehensive Plan. The property is zoned Recreation Commercial, and the proposed use is allowed under this zoning classification. Our proposal represents an appropriate use of the property. In 1976, the town of Sevastopol adopted Door County Comprehensive Zoning which brought the township under county zoning jurisdiction. From the onset, the property was zoned Recreation (REC). In 1995, Door County completed a comprehensive revision of its zoning ordinance and zoning maps. At that time, the town of Sevastopol adopted the revised zoning ordinance and maps, which resulted in the subject property being rezoned from Recreation (REC) to Recreational Commercial (RC). This zoning classification was reaffirmed by the County and the Town of Sevastopol during the creation and ratification of their Smart Growth Plan in 2008, as well as subsequent comprehensive plan updates.

The subject property, zoned Recreational Commercial (RC), allows precisely the type of development being proposed. The RC classification was created for "high concentrations of recreational uses" ... and "favors recreational uses such as golf courses, ski resorts, multiple occupancy developments (MOD), and marinas and restaurants". This is exemplified by the fact that it is adjacent to the George Pinney County Park, one of the busiest boat launches in the county park system.

As the zoning classification has remained essentially unchanged for 43 years, and has been incorporated in every iteration of the Sevastopol comprehensive plan since that time, it's clear that a MOD of the size and scope of what we are proposing is not only allowed, but something that the zoning code advocates be placed in RC districts. In fact, the specifications of the RC classification allows for a much larger MOD, with approximately double the bedroom density we are proposing.

SECTION #4

Sanitary Waste Disposal System

Item #4

Provision of an Approved Sanitary Waste Disposal System:

The sanitary disposal system will be a Private Onsite Wastewater Treatment System (POTS)

The proposed project will be served with an on-site sewage holding tank. The site was analyzed by a soil scientist as well as Door County to determine a holding tank is the only option. This is based on the current exposed bedrock conditions throughout the majority of the site.

The tank will be a pre-cast concrete 40,000 gallon tank in accordance with DSPS and Door County regulations. The tank will be served by a designated all-weather access drive.

The tank will be placed greater than 90 feet from the center of CTH B to provide adequate space for an intense landscape buffer with the goal of protecting view of the tanker truck.

The tank will be located approximately 470 feet from the nearest existing residence.

Based on anticipated flows at full build-out during peak season, an estimated average of two semi-tanker loads per day would be pumped from the tank.

Wastewater will be directed to the holding tank using a DSPS approved private interceptor sewer main system. This will include 8-inch PVC sewer mains with manholes spaced at no greater than 400 feet per DNR standards. The entire system will drain by gravity to the tank. The site grades will allow gravity service eliminating any need for a lift station.

County of Door
LAND USE SERVICES: SANITARIAN
County Government Center
421 Nebraska Street
Sturgeon Bay, WI 54235

John Teichtler
County Sanitarian
(920) 746-2308
sanitarian@co.door.wi.us

July 29, 2019

PETER HURTH
BAUDHUIN SURVEYING & ENGINEERING
312 N 5TH AVE
PO BOX 105
STURGEON BAY WI 54235

RE: Margaret Dreutzer Trust Property
Section 13, Town 28 North, Range 25 East
Town of Sevastopol – Tax #022-01-13282511

Good Morning:

An onsite inspection was conducted of the above described property. The purpose of this inspection was to determine the soil and site suitability for a private onsite waste treatment system to serve this property.

Because of the presence of bedrock at the surface, the only type of private onsite waste treatment system that can be installed on this property would be a holding tank.

Yours,

John Teichtler

John Teichtler
County Sanitarian

JT:lg

Quarry Bluff
117 Site Development

1. Description:

   A proposed 117 site development consisting of a potential 117 motor home pads with a smaller residential home footprint at each site, plus recreational center and amenities will be developed on a tract of land located along Bayshore Drive in the Town of Sevastopol, Door County, Wisconsin. The site is an abandoned limestone quarry with limited vegetation and minimal soil (if any). The project will be served by a shared holding tank system (privately-owned wastewater treatment system (POWTS)).

2. Flow calculation per metered data collected in Wisconsin and Minnesota from a total of 297 homes results in an average daily flow of 41.6 gallons per day per bedroom.

   a. Sites on sewer: 117 total RV sites with ability to construct a home on the same lot.
   b. Assume each lot has the equivalent of 2.5 bedrooms. This is a reasonable assumption based on the demographics suggesting the owner will be a 55 to 75-year-old couple with occasional guests.
   c. The community will be gated, with use of the rec-center limited to owners and their guests.
      1. 117 lots x 2.5 bedrooms = 292.5 bedrooms x 41.55 gpd per site = 12,154 gpd
   d. 3 employees @13 gpd = 39 gpd code flow
   e. Estimated daily flow: 12,192 gpd

3. Holding Tank Design:

   a. Tank shall be 3 times the estimated flow if year-round, all-weather access is provided. A service road with year-round access is proposed.
      i. 3 x 12,192 = 36,576 gallons
   b. Therefore, select a 40,000-gallon precast concrete tank
   c. Septic Maintenance provides holding tank pumping service to the area, including Westwood Shores condo.
   d. Based on discussion with Tony Gosser, owner of Septic Maintenance, the site would likely be served with a 7,000-gallon tanker.
   e. Therefore, one can conclude, once the site is built to full capacity, the tank would be pumped an average of just under two times daily.

4. Proposed location:
   a. The proposed tank site was selected to exceed all required setbacks and provide a safe access point for the pumper truck.
   b. The service drive for the tank will provide all-weather access and was placed to exceed stopping sight distance requirements along CTH B.

c. The access drive for the tank is separate from the main access to the development.
d. The tank will be located greater than 400 feet from the nearest existing residence to eliminate concern regarding potential odor.
e. The tank will be placed greater than 90 feet from the centerline of CTH B exceeding the home setback requirement in this area.
f. A quick disconnect suction riser will be provided to eliminate the need to open the cover at each pump-out.
g. A lift pump can be added in the tank to provide quicker pumping rates.
h. An intense landscape buffer will be provided between the pumper truck area and CTH B. The landscape buffer will meet the requirements of Door County Zoning.

5. Review jurisdiction

- The septic system will fall under Wisconsin Department of Safety and Professional Services (DSPS) jurisdiction and review. If the on-site system were to use a drainfield into the soil as its final disposal method and exceed 12,000 gallons per day the Wisconsin Department of Natural Resources (DNR) would have permitting authority and perform a joint review with DSPS.

6. Tank Ballasts

Soil maps indicate the soils at the proposed tank location will be Alpena Soils with depth to ground water greater than 6 feet down, and bedrock depths exceeding 60 inches. The soils are well drained to excessively well drained gravelly sandy loam. For this analysis the ballasts design was based on seasonal water table reaching a maximum level of 60 inches below existing grade. A soil boring was performed at the tank location indicating mottling in the soil at an elevation of 591.0 +/-

<u>40,000 gallon tank:</u>

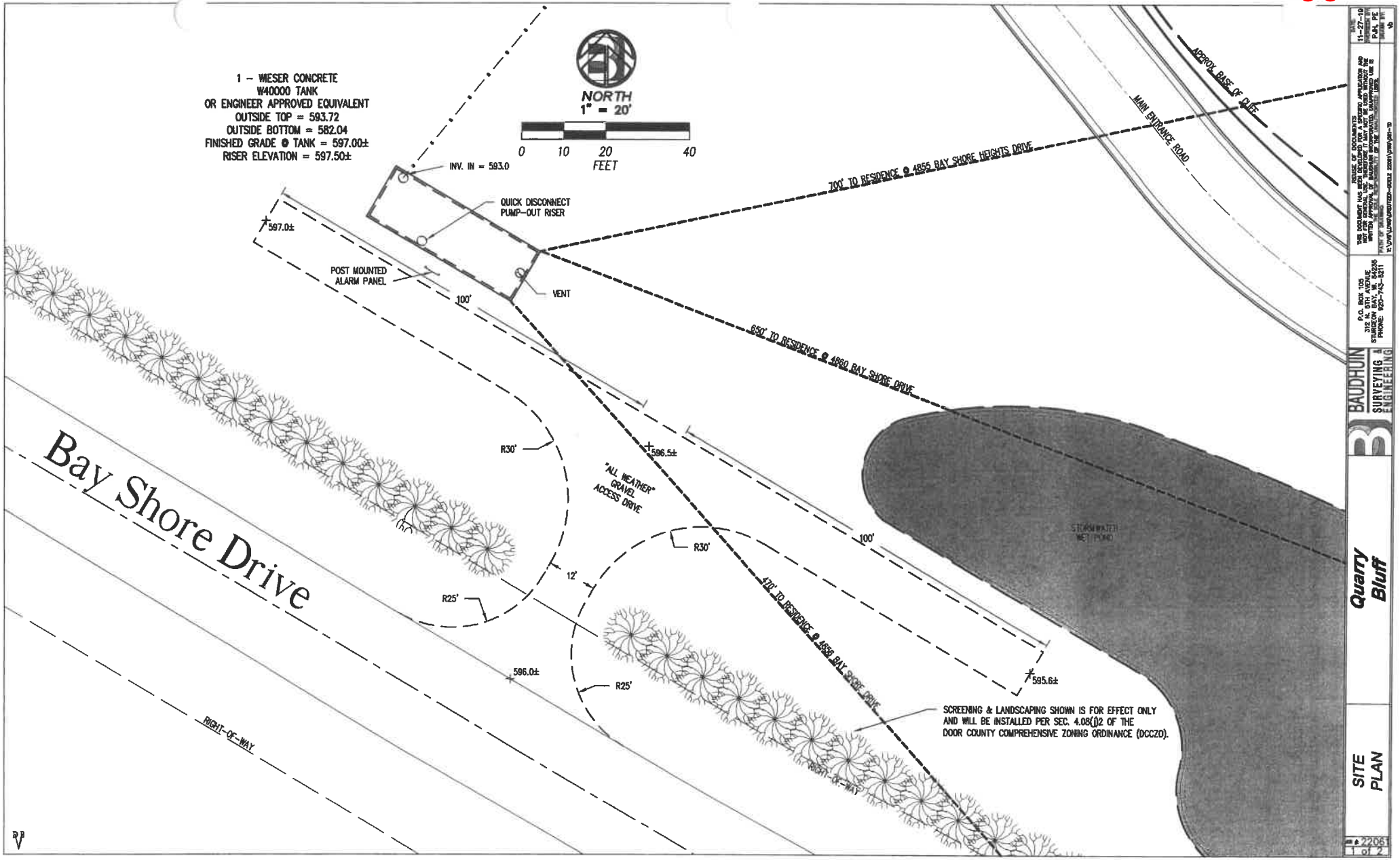
a. Buoyancy check:
   i. Sewer invert into tank = 593.0
   ii. Outside bottom of tank = 582.04
   iii. Finished ground grade = 597.0
   iv. 100-year flood level of bay 200 feet west = 584.6
   v. Worst case water table = 591.0
   vi. Displaced volume of water if water reaches 591.0:
      1. Surface area of tank bottom = 560 sqft
      2. Displaced water = (591.0 – 582.04)(560 sqft) = 5,018 cuft
   vii. Buoyancy force up = 5,018 cuft x 62.4 lbs/cuft = 313,098 lbs up
   viii. Weight of tank = 140,000 lbs down

ix. Weight of soil over tank = 560 sqft x 3.28 ft deep x 110 lbs/cuft = 202,048 lbs down.
x. Therefore, total down = 342,048 lbs vs. 313,098 lbs up, therefore no ballasts/anchoring required.

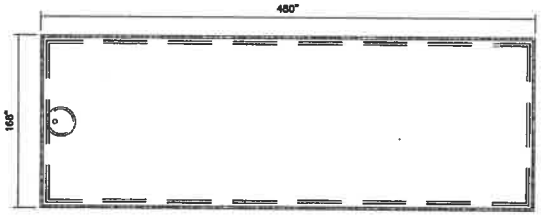
7. Provisions:
   a. Letter from soil scientist indicates no room to site a standard drain field system due to the flows and lack of existing soils on the site.

   b. Verification from local treatment plant that capacity and willingness to accept flows.

   c. Operations and maintenance manual made part of this system shall be followed. A qualified professional shall be involved with monitoring requirements outlined in said manual.

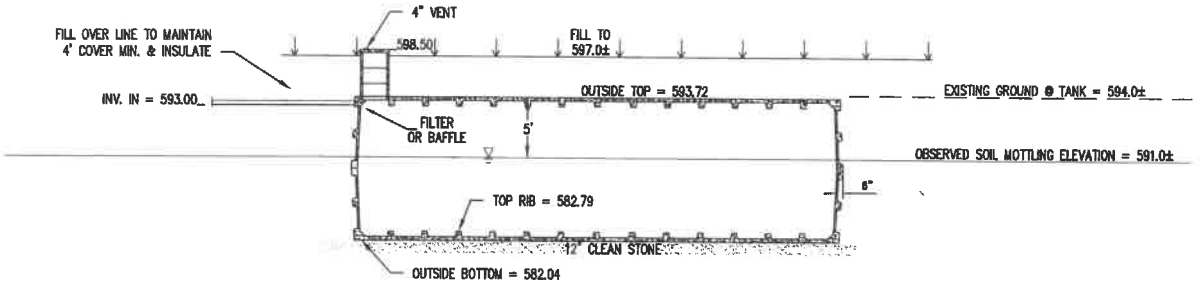

1 - WIESER CONCRETE
W40000 TANK
OR ENGINEER APPROVED EQUIVALENT
OUTSIDE TOP = 593.72
OUTSIDE BOTTOM = 582.04
FINISHED GRADE @ TANK = 597.00±
RISER ELEVATION = 597.50±
NORTH
1" = 20'
0 10 20 40
FEET
INV. IN = 593.0
QUICK DISCONNECT PUMP-OUT RISER
VENT
POST MOUNTED ALARM PANEL
597.0±
100'
R30'
596.5±
"ALL WEATHER" GRAVEL ACCESS DRIVE
R30'
12'
R25'
596.0±
R25'
100'
595.6±
700' TO RESIDENCE @ 4855 BAY SHORE HEIGHTS DRIVE
650' TO RESIDENCE @ 4860 BAY SHORE DRIVE
470' TO RESIDENCE @ 4858 BAY SHORE DRIVE
MAIN ENTRANCE ROAD
APPROX. BASE OF CLIFF
STORMWATER WET POND
Bay Shore Drive
RIGHT-OF-WAY
RIGHT-OF-WAY
SCREENING & LANDSCAPING SHOWN IS FOR EFFECT ONLY AND WILL BE INSTALLED PER SEC. 4.08(J)2 OF THE DOOR COUNTY COMPREHENSIVE ZONING ORDINANCE (DCCZO).
BAUDHUIN
SURVEYING & ENGINEERING
P.O. BOX 105
312 N. 14TH AVENUE
STURGEON BAY, WI. 54235
PHONE: 920-743-5211
Quarry Bluff
SITE PLAN
2206
1 of 2

1 – WIESER CONCRETE
W40000 TANK
OR ENGINEER APPROVED EQUIVALENT
OUTSIDE TOP = 593.72
OUTSIDE BOTTOM = 582.04
FINISHED GRADE @ TANK = 597.00±
RISER ELEVATION = 597.50±



PLAN VIEW
1" = 10'

1 – WIESER CONCRETE
W40000 TANK
OR ENGINEER APPROVED EQUIVALENT
OUTSIDE TOP = 593.72
OUTSIDE BOTTOM = 582.04
FINISHED GRADE @ TANK = 597.00±
RISER ELEVATION = 597.50±



PROFILE VIEW
1" = 10'

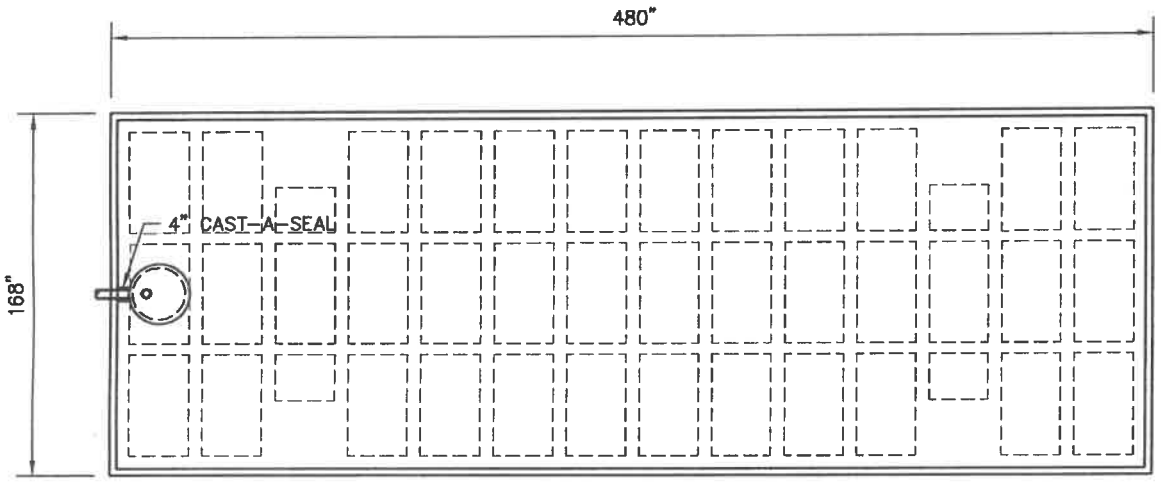
BAUDHUIN SURVEYING & ENGINEERING
P.O. BOX 105
312 N. 5TH AVENUE
STURGEON BAY, WI. 54235
PHONE: 920-743-6211

Quarry Bluff

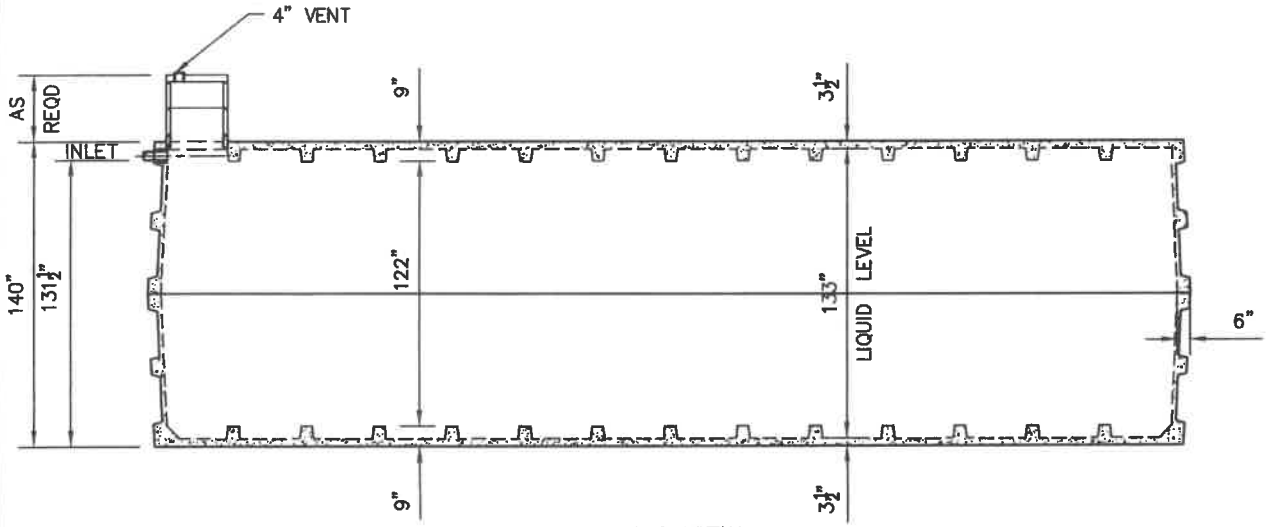
HOLDING TANKS
PLAN & PROFILE

P 2206
2 of 2

W40000 STORAGE TANK SPECIFICATIONS



TOP VIEW



SIDE VIEW

DIMENSIONS:
- WALL: 6" RIBBED
- BOTTOM: 9" RIBBED
- COVER: 9" RIBBED
- MANHOLE: 24" I.D. PRECAST RISER
- HEIGHT: 136" O.D.
- LENGTH: 480" O.D.
- WIDTH: 168" O.D.
- LIQUID LEVEL 133"
- WEIGHT: 70,000 LBS PER SECTION

INLET ¾" CAST-A-SEAL BOOT OR EQUAL

LIQUID CAPACITY: 305.00 GAL/IN

LOADING DESIGN: 8'-0" UNSATURATED SOIL

TANK CAN BE USED AS:
STORAGE TANK

TANK: MIX DESIGN #9 (SMALL FIBER)

CUSTOMIZED TANKS:
FOR CUSTOM TANKS CONTACT WIESER CONCRETE

TANKS ARE MANUFACTURED TO MEET OR EXCEED ASTM C-1227 REQUIREMENTS

DRAWINGS SUBMITTED FOR APPROVAL

APPROVED BY: _____

APPROVAL DATE: _____

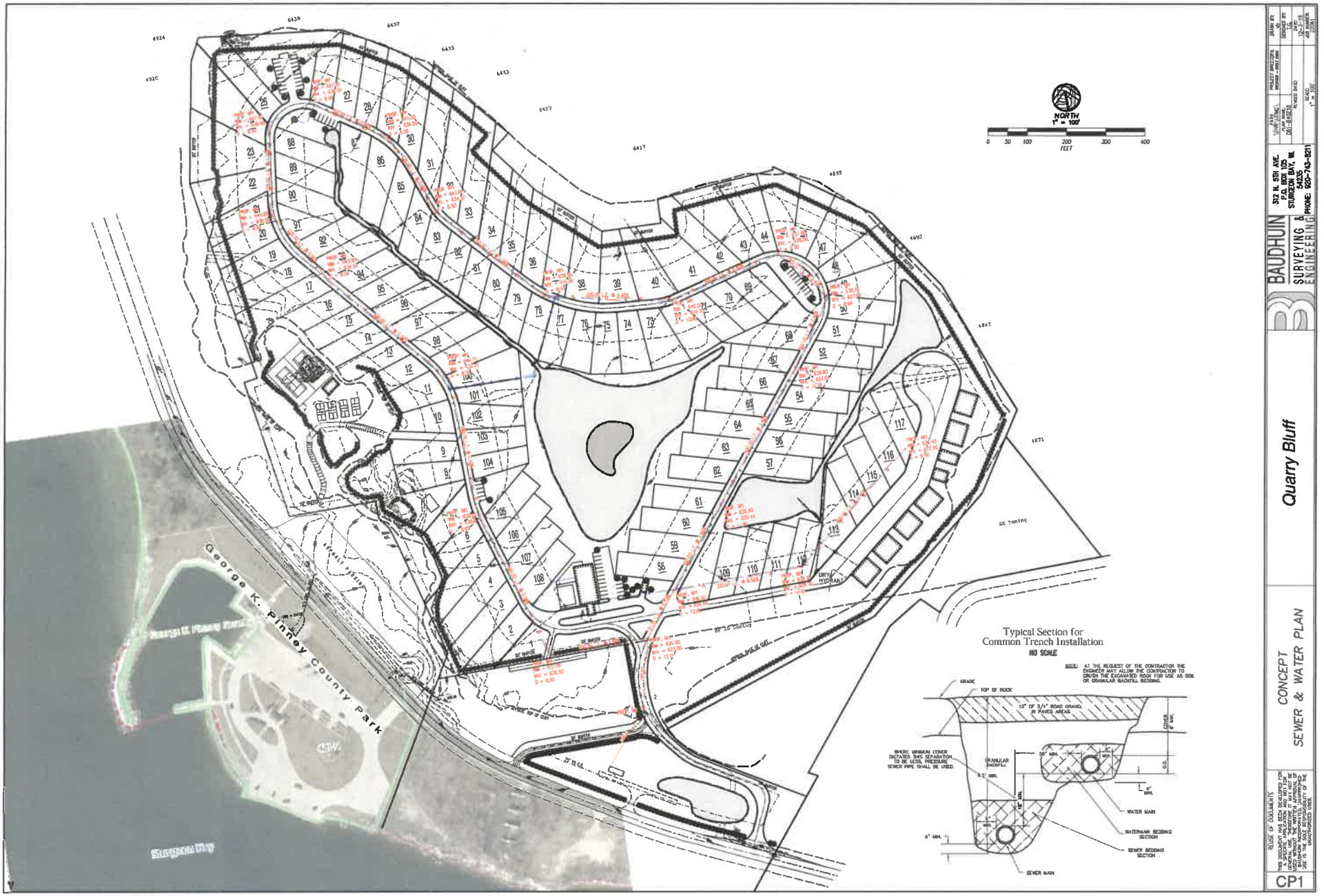
PRODUCTS NEEDED BY: _____

SCALE: 5/32"=1'-0" PRE-POUR:
REV. POST-POUR:
DATE:
DRAWN BY: WCP
DATE: 00/00/00
FILE: W40000 HOLDING

WIESER CONCRETE
W3716 US HWY 10 MAIDEN ROCK, WI 54750
800-325-8456

W40000 STORAGE SEPTIC MANUAL

SHEET NO. 1 OF 1



BAUDHUIN SURVEYING & ENGINEERING
312 N. 15TH AVE.
P.O. BOX 125
STURGEON BAY, WI.
54235
PHONE: 920-743-1021

Quarry Bluff

CONCEPT
SEWER & WATER PLAN

CP1

SECTION #5

Potable Water Supply

Item #5

Provision for a Potable Water Supply

Water service will be provided by two drilled wells. Based on discussions with the DNR regarding ownership and the type of use for the property, it will be a 'noncommunity' public water system and NR 812 rules will apply for well construction. Assuming there will be more than 25 of the same people served for 60 or more days a year, it would further be considered a 'non-transient' noncommunity water system.

Both wells will have a 10-inch upper drill hole, 170 feet of 6-inch diameter steel casing and a total depth of approximately 300 feet. Wells will be housed in heated 10-foot by 10-foot pumphouses and will be fitted with 15 horsepower variable frequency drive pumps, controls and pressure tank systems. Each system is sized to handle the entire development's water needs should the other system be shut down for maintenance or repair work.

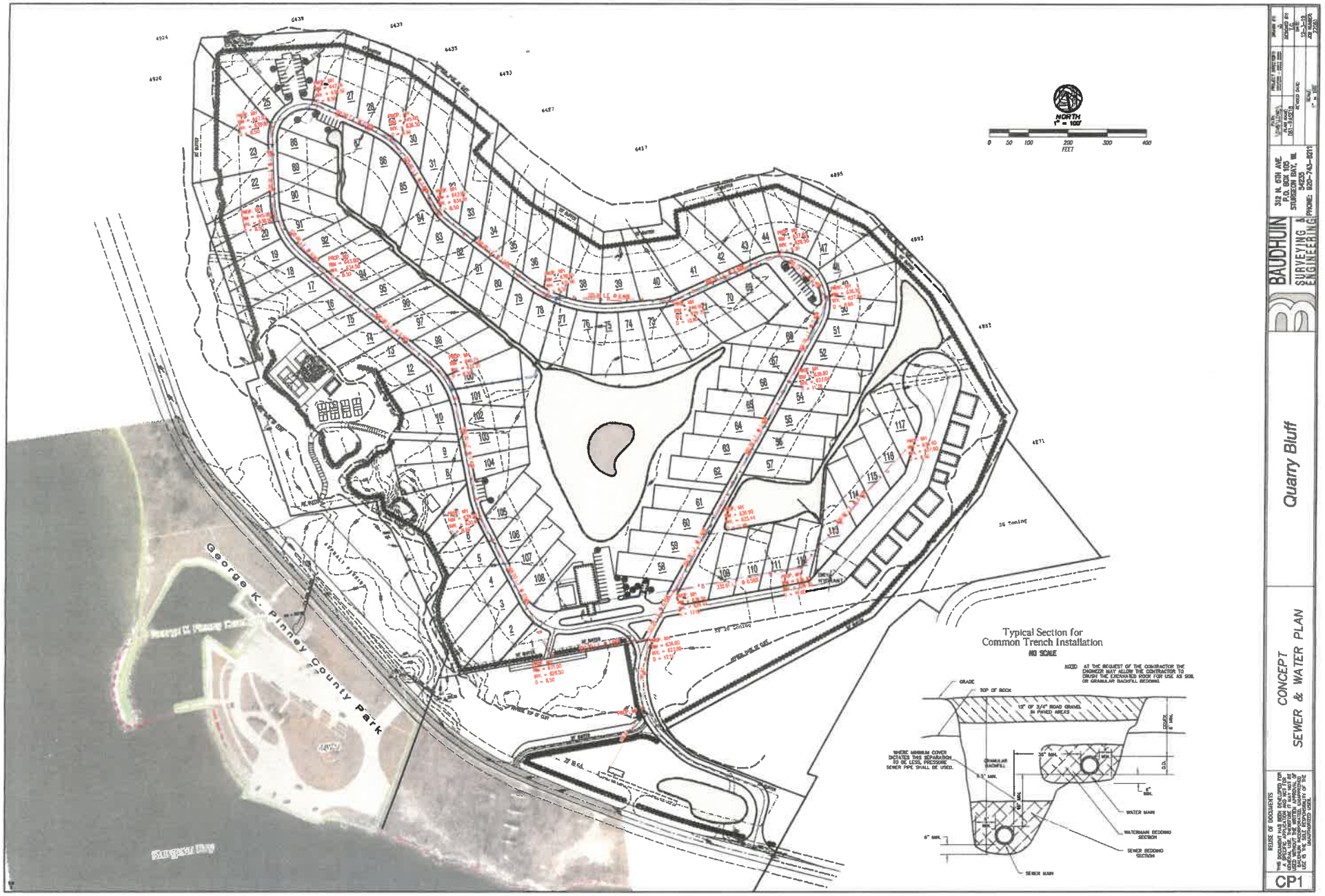
Well construction plans have been submitted to the DNR for review and approval. Water quality monitoring, sampling and testing protocols will be provided as part of the permit.

The well system described in this submittal will feed a private watermain throughout the community. The water main will be regulated by DSPS. Water main pipes will be PVC ranging in size from 1" to 6" diameter.

The water system and well capacities were estimated based on the number of connections and probability of simultaneous use.

This project has a total estimated simultaneous peak equaling approximately 150 gallons per minute (gpm), at full capacity at full build-out. This flow would be split between the two proposed wells.

This area is mapped to have between 200 to 400 gpm capacity in the aquifer. A letter from a local well contractor confirms the capacity in this area exceeding the proposed demand, without negative impact to the neighboring wells.


NORTH
1" = 100'
0 50 100 200 300 400
FEET
George K. Pinney County Park
Typical Section for
Common Trench Installation
NO SCALE
GRADE
TOP OF ROCK
12" OF 3/4" ROAD GRAVEL IN PAVED AREAS
WHERE MINIMUM COVER DICTATES THIS SEPARATION TO BE LESS, PRESSURE SEWER PIPE SHALL BE USED.
GRANULAR BACKFILL
WATER MAIN
WATERMAIN BEDDING SECTION
SEWER BEDDING SECTION
SEWER MAIN
BAUDHUIN
SURVEYING & ENGINEERING
312 N. 6TH AVE.
P.O. BOX 105
STURGEON BAY, WI.
54235
PHONE: 920-743-8211
Quarry Bluff
CONCEPT
SEWER & WATER PLAN
CP1

State of Wisconsin
Department of Natural Resources
Bureau of Drinking Water and Groundwater, DG/5
PO Box 7921, Madison WI 53707-7921
dnr.wi.gov

Public Water System Approval Request

Form 3300-260 (R 12/16)

Notice: This form is authorized by ss. 280.11, 281.11, 281.19 (1) and (2), and 281.41, Wis. Stats., and ss. NR 108.04 (2)(a) and 811.08 (1), Wis. Adm. Code. Completion of this form or a similar form approved by the Department of Natural Resources is mandatory. Personal information collected will be used for administrative purposes and may be provided to requesters to the extent required by Wisconsin's Open Records Law [ss. 19.31-19.39, Wis. Stats.]. Unless otherwise noted all citations refer to Wis. Adm. Code.

A. System Information

Water System Name

Quarry Bluff

Water System Infrastructure Owned By: (select one)

- ○ Government Entity (City, Village)
- ○ Sanitary or Utility District
- ○ Utility Commission
- ◉ Privately Owned (Company or Individual)

Name of Water System Owner (if different than Water System Name)

Quarry Bluff Development, LLC

B. Water System Owner

(examples: municipal clerk, sanitary district president, utility commission clerk, OTM owner)

Name: Quarry Bluff Development, LLC

Street Address: PO Box 54

City	State	ZIP Code
Fish Creek	WI	54212

Phone Number	Fax Number	Cell Number (optional)
		(920) 495-9522

Email Address: mike@hksportsfields.com

Water System Representative or Contact (if not Owner)

(examples: water superintendent, director of public works, operator)

Name:

Street Address:

City	State	ZIP Code

Phone Number	Fax Number	Cell Number (optional)

Email Address:

C. Designer/Constructor Information

Name: Steven J. Parent, P.E.

Firm Name: Baudhuin Incorporated

Street Address: PO Box 105

Phone Number	Fax Number	Cell Number (optional)
(920) 743-8211		

City	State	ZIP Code
Sturgeon Bay	WI	54235

Email Address: sparent@baudhuin.com

D. Project Location (As applicable)

○ City ◉ Town ○ Village

of Sevastopol

County: Door

Will Safe Drinking Water Loan Program (SDWLP) funds be requested for this project? ○ Yes ○ No

Brief Project Description (DO NOT LEAVE BLANK)

New wells to serve a 117 unit motor coach park with attached bunkhouses. Work to include drilling two wells, constructing pumphouses and installing well pumps, pressure tanks and controls.

Applicability: This form applies to projects being submitted for municipal and other-than-municipal community, public water systems.

Number of Copies: Submit three copies of all the plans, specifications, forms and attachments. Only one copy needs to be submitted for water main only projects.

State of Wisconsin
Department of Natural Resources
Bureau of Drinking Water and Groundwater, DG/5
PO Box 7921, Madison WI 53707-7921
dnr.wi.gov

Public Well Approval Submittal Request

Form 3300-044 (R 04/19)

Notice: This form is authorized by ss. 280.11, 281.11, 281.19 (1) and (2), and 281.41, Wis. Stats., and ss. NR 108.04 (2)(a) and 811.08 (1), Wis. Adm. Code. Completion of this form or a similar form approved by the Department of Natural Resources (DNR) is mandatory. Personal information collected will be used for administrative purposes and may be provided to requesters to the extent required by Wisconsin's Open Records Law [ss. 19.31-19.39, Wis. Stats.]. Unless otherwise noted all citations refer to Wis. Adm. Code.

A. Water System Information

Water System Name	Well Number(s)
Quarry Bluff	001 & 002

Project Name

Quarry Bluff

B. Well Siting Information (ss. NR 811.09(1)(b) & NR 811.09(4)(j)1.)

1. For any municipal well, a Well Site Investigation Report

   ◯ has previously been submitted to the Department and was approved in writing, or

   ◯ is attached to this submittal (three copies).

2. For any other-than-municipal (OTM) public well, complete the following:

   a. Has the Department's regional OTM staff person been contacted to inspect the well site as is recommended?
   NOTE: Go to dnr.wi.gov, Search: Staff Directory, then type OTM into the Subject field and hit enter to generate a list of the Department's OTM Staff.

   b. Indicate the legal description of the well location:

	¼ ¼	¼	Section	Township	Range			County
Well # 1			12	28 N	25	◉ E ◯ W	◯ City ◉ Town ◯ Village of Sevastopol	Door
Well # 2	NE	NE	13	28 N	25 E			

   c. Indicate the well location by latitude and longitude:

	Latitude (decimal degrees)	Longitude (decimal degrees)
Well # 1	44.9083000	-87.4041000
Well # 2	44.904800	-87.402237

   d. Provide a drawing(s) and/or maps(s) that show the property boundaries, the location of the well on the site, and the distances and directions to all other wells, improvements and contamination sources on the property or adjacent to the property.
   NOTE: See s. NR 811.12(5)(d) for the minimum required separation distances to common contamination sources.

3. For any municipal or OTM high capacity well (≥ 70 gallons per minute) proposed, has a check made out to the Department for $500 been included along with the plans and specifications submitted for the construction of the new well? (s. 281.34(2), Stats.) ◉ Yes ◯ No

C. Test Well Information (s. NR 811.12(1)(g))

4. A test well ◯ has been or ◯ will be constructed ◯ Yes ◉ No

   If yes:

   a. Has a Well Construction Report for the test well been included with the submittal? ◯ Yes ◯ No ◯ N/A

   b. Has the test well pumping information been submitted? ◯ Yes ◯ No ◯ N/A

   c. Has the test well water quality information been submitted? ◯ Yes ◯ No ◯ N/A

   d. Will the test well be converted into the final well? ◯ Yes ◯ No

   e. Will the test well be abandoned prior to placing the final well in service? ◯ Yes ◯ No ◯ N/A

   f. Provide comments on any water quality issues of concern and resultant actions to be taken:

D. Permanent Well Construction Information (ss. NR 811.09(1)(b) & NR 811.12)

5. Has a drawing of the well showing diameters, depths, construction details and the geologic formations and formation thicknesses been included? (●) Yes ( ) No

6. Drilling method(s) to be used:

Rotary

7. Will a detectable free chlorine residual be maintained in the well during drilling operations? (s. NR811.12(1)(f)) (●) Yes ( ) No

8. Provide the following information for each casing to be used. (s. NR 811.12(7))

a. New prime pipe, or used (outer casing(s) only)? (●) New ( ) Used

b. Casing specifications:

6" ASTM A53 Plain End Welded Pipe

c. Wall thickness:

0.280 inches

d. Plain-end welded or threaded and coupled? (●) Plain-end welded ( ) Threaded and coupled

e. Centering guides to be installed? (●) Yes ( ) No

9. Provide the following information for each screen section. (s. NR 811.12(10))

a. Screen manufacturer:

b. Screen type:

c. Screen slot size(s):

d. Screen bottom plate material:

e. Method for attaching screen to casing:

10. Provide the following information for each annular opening to be grouted. (s. NR 811.12(14))

a. Width of annular opening to be grouted:

2 inches

b. Grout depth:

170 feet

c. Grout specifications:

Neat Grout Cement ASTM C150

d. Grouting method:

Braidenhead

e. Grouting equipment to be used:

Grout Pump, Tremie Pipe

f. Attempt to circulate bentonite slurry prior to grouting? (●) Yes ( ) No ( ) N/A

g. Backup grout pump and tremie pipe on site? (●) Yes ( ) No

h. Means to be provided for measuring grout density:

Mud balance in both the grout pump hopper and at point where grout returns out of annular space.

Public Well Approval Submittal Request

Form 3300-044 (R 04/19)

i. Grout allowed to cure for minimum of 72 hours? ◉ Yes ○ No

j. Regional DNR staff to be given 48 hour advance notice of grouting? ◉ Yes ○ No

k. Will there be an outer casing? ○ Yes ◉ No

l. If yes - New prime pipe, or used (outer casing(s) only)? ○ New ○ Used

Casing specifications:

Wall thickness:

Plain-end welded or threaded and coupled? ○ Plain-end welded ○ Threaded and coupled

Centering guides to be installed? ○ Yes ○ No

m. Outer well casing to be pulled out entirely during/after grouting? ○ Yes ○ No ◉ N/A

11. Plumbness and alignment testing: (s. NR 811.12(15))

a. Will the completed well be tested for plumbness and alignment? ◉ Yes ○ No ○ N/A

12. Yield and drawdown testing: (s. NR 811.12(16))

a. The completed well will be continuously test pumped for a minimum of 4.00 hours.

b. The proposed test pumping rate(s) will be 85.00 gallons per minute.

c. Drawdown and recovery information will be recorded per s. NR 811.12(16)(e)? ◉ Yes ○ No

13. Geological data: (s. NR 811.12(17))

a. Will formation samples be collected at 5-foot intervals and at each pronounced change in geologic formation and submitted to the Wisconsin State Geological and Natural History Survey in Madison? ◉ Yes ○ No

14. The finished well will be sampled near the end of the test pumping for: (ss. NR 811.12(19)&(20))

a. Bacteriological quality ◉ Yes ○ No

b. Inorganic parameters on a DNR supplied form ◉ Yes ○ No

c. Volatile organic parameters on a DNR supplied form ◉ Yes ○ No

d. Synthetic organic parameters on a DNR supplied form ◉ Yes ○ No

e. Radionuclide parameters on a DNR supplied form ◉ Yes ○ No

Certification

I hereby certify that the above information and attachments are accurate and complete to the best of my knowledge.

Signature of Professional Engineer/Consultant/Well Driller	Date Signed
Steven J. Parent	11-7-19

Printed Name of Professional Engineer/Consultant/Well Driller	Company Name
Steven J. Parent, P.E.	Baudhuin Incorporated
Wisconsin P.E. Number (if applicable)	**Wis Well Driller License Number (if applicable)**
E-25577	

Email Address	Cell Phone # (incl. area code)	Alt Phone # (incl. area code)	Fax # (incl. area code)
sparent@baudhuin.com	(920) 421-1413	(920) 743-8211	

NOTE: Plan submittal by a P.E. is not required for new well construction at other-than-municipal community water systems unless seven (7) or more homes are being served (a subdivision water system).

STANDARD WELL CONSTRUCTION SPECIFICATIONS

1. **Well Location**
   a. The well shall be located as shown on the plans.
   b. The well shall be located so as to meet the requirements of s. NR 811.16(4), Wis. Adm. Code. If those separation distances cannot be maintained, the Public Water Supply Section must be contacted for a variance.
2. **Driller Qualifications**
   a. The well driller shall be a licensed driller registered in the State of Wisconsin under Chapter NR 146, Wis. Adm. Code.
3. **Formation Sampling**
   a. Formation samples shall be collected at 5 foot intervals and at every change in formation. The samples shall be bagged and shipped to the Wisconsin Geological and Natural History Survey, 3817 Mineral Point Road, Madison, Wisconsin 53705.
4. **Materials of Construction**
   a. Screens - The screen shall be of continuous slot, wire wound design, type 304 18-8 stainless steel.
   b. Casing - The protective well casing shall be new, unused, nonreclaimed, prime steel casing having the minimum wall thickness specified in table 1, ch. NR 811, Wis. Adm. Code. The casing shall be marked in accordance with ch. NR 112, Wis. Adm. Code, and shall meet ASTM A-53 Grades A or B; ASTM A-106; ASTM A-589 - Type I, Grades A or B, Type II, Grade A; or API 5L, 5LX, 5A, 5AX specifications. The minimum protective casing wall thickness shall be as follows: 6-inch diameter, 0.280-inches; 8-inch diameter, 0.322-inches; 10-inch diameter, 0.365-inches; 12-inch diameter, 0.375 inches.
   c. Joints - The well casing shall be assembled using welded joints meeting s. NR 112.18, Wis. Adm. Code, requirements.
   d. Packers - Packers shall be of a material that will not impart taste, odors, toxic substances or bacteriological contamination to the water in the well. Lead packers shall not be used.
5. **Methods of Construction**
   a. The well shall be constructed by percussion or rotary methods.
   b. Water used in the construction of the well shall be obtained from an uncontaminated source. The water shall be disinfected with chlorine. A minimum 10 mg/l chlorine residual shall be maintained in the well during the entire construction process.
   c. A drive shoe shall be welded to the bottom of any casing to be driven.
   d. Bentonites, drilling foams, or other drilling aids shall be approved by the Department of Natural Resources prior to their use. Products not on the Department's approved list shall not be used.
6. **Well Grouting**
   a. The well shall be grouted by one of the approved pressure grouting methods using a grout pump. Approved methods include the conductor pipe method, the grout float shoe method, the well seal method, or the street elbow method. Any of the Halliburton grouting methods may be used in noncreviced formations provided a special request accompanies the request for approval of the well construction and written Department approval is obtained.
   b. Regardless of the method of grouting a grout pump and conductor pipe shall be provided so that if the proposed method of grouting fails an alternate method is available on site.
   c. In fractured bedrock bentonite shall be circulated and circulation to the ground surface achieved prior to grouting the annular space.
   d. The conductor pipe shall be metal or a rubber coated, fiber or steel braided, reinforced hose with a minimum pressure rating of 300 psi. Plastic pipe shall not be used.
   e. Use of grout additives, including bentonite, shall be used only with prior written approval of the Department of Natural Resources.

f. The grout shall be neat cement grout consisting of ASTM C150, Type 1 or API-10A Portland cement and not more than 6 gallons of water, from a known uncontaminated source, per 94 pounds of cement.

g. The grout shall be placed from the bottom of the annular opening to the ground surface in one continuous operation.

h. After grouting the well shall be allowed to stand for a minimum of 72 hours prior to resuming any drilling or pumping operations.

7. Development

a. All wells shall be developed and pumped until the water is clear and free of sand and turbidity. The development shall be by one or a combination of the following methods; mechanical surging, air surging, over-pumping, hydraulic jetting, or air jetting.

8. Special Development

a. Prior to any special development such as blasting, hydrofracturing, or chemical conditioning a written approval of the process shall be obtained from the Department of Natural Resources.

9. Final Disinfection

a. Chlorine shall be used as the disinfectant. The specific compound shall be a bleach without additives, liquid sodium hypochlorite, calcium hypochlorite tablets, or other compounds approved by the Department for use in disinfection of wells. The quantity of chlorine compound shall be sufficient to produce a minimum 100 mg/l residual in the entire well for a minimum of 12 hours.

10. Test Pumping

a. Set up - After development has been completed a test pump and all necessary accessories including temporary discharge piping, water meter, smooth end sampling faucet, means for measuring water levels, and valving shall be provided. The test pump shall have a capacity equal to the anticipated capacity of the final well pump.

b. Procedures - The test pumping shall commence after the static water level has recovered from development. The pump test shall be at the rate, in gallons per minute, anticipated for the final well pump. The pump test shall continue until the well has stabilized or until 4 hours has elapsed. Drawdown and pumping rates shall be monitored. The drawdown shall be monitored according to the following schedule.

Elapsed Time (minutes)	Measurement Interval
0-10	Every minute
10-45	Every 5 minutes
45-90	Every 15 minutes
90 and after	Every 30 minutes

c. Records - The contractor shall keep accurate records of the final pump test and furnish a copy to the Department of Natural Resources upon completion of the well.

11. Plumbness and Alignment

a. All casings shall be placed concentrically within the drillhole or within each other. The contractor shall furnish all the labor, tools, and equipment necessary to perform plumbness and alignment tests and to demonstrate compliance of the work with the following:

i. Variance from the vertical of 2/3 the smallest inside diameter of that part of the well being tested per 100 feet of depth to the depth of the pump setting plus 25% shall not be exceeded.

ii. The well shall allow free passage of a 40 foot section of pipe or a dummy to the depth of the pump setting plus 25%. The outside diameter of the pipe or dummy shall not be more than 0.5-inch smaller than the diameter being tested.

b. The contractor shall maintain an accurate record of the plumbness and alignment tests and furnish a copy to the owner and to the Department of Natural Resources along with the well constructor's report.

12. Capping

a. The contractor shall provide temporary capping of the well and any unsealed annular space during the construction period when work on the well is not being done. Upon completion of the well a watertight, vandal-proof cap shall be placed on the well until the permanent pump is installed.

13. **Water Quality Sampling**

a. Bacteriological Sampling - Two water samples taken at least 8 hours apart shall be taken for bacteriological analysis.

b. Inorganic Sampling - One water sample shall be collected to be analyzed for inorganic parameters such as nitrates, chlorides, and hardness. A second sample shall be collected in a smaller "metals bottle" and shall be analyzed for iron and manganese.

c. Organic Sampling - Samples shall be collected to be analyzed for Volatile Organic Chemicals (VOC's) and Synthetic Organic Chemicals (SOC's) as required in the Department approval letter.

d. Radionuclides - Samples shall be collected to be analyzed for gross alpha and radon gas analyses. The gross alpha sample shall also be analyzed for radium and uranium if required by the Department approval letter.

e. Bottles - Bottles for sampling shall be obtained from a Safe Drinking Water Act certified laboratory.

f. Laboratories - A Safe Drinking Water Act certified laboratory shall be used for sample analyses except for radionuclide analyses. A U.S. EPA certified laboratory shall be used for radionuclide analyses. A listing of laboratories is available from the Department of Natural Resources.

14. **Reporting**

a. The well driller shall submit a Wisconsin Well Construction Report (Form 3300-77A) to the Department within 30 days following the day the well was constructed. A copy of the report shall be provided to the owner. A copy of the pumping test data and a copy of the plumbness and alignment data shall accompany the construction report to the Department. The report shall be submitted to: Department of Natural Resources, Public Water Supply Section, P.O. Box 7921, Madison, WI 53707.

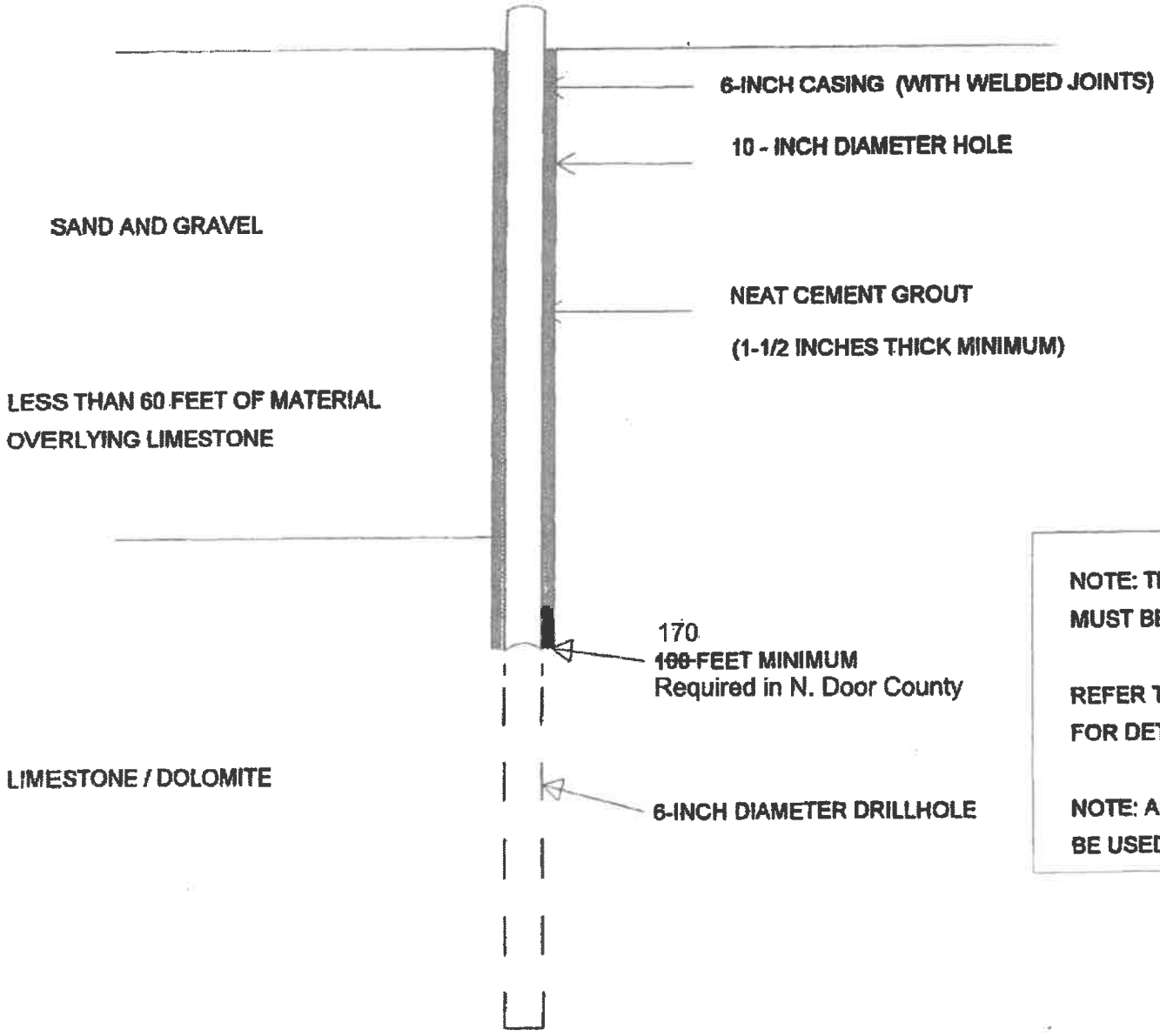
b. Completed copies of the Department water quality laboratory reporting forms shall be returned to the Department as soon as the results of the chemical analyses are obtained.

c. Contamination Source Inventory - A Public Water Supply Contamination Source Inventory (Form 3300-215) shall be completed and returned to the Department prior to placing the well in sevice.

15. **DNR Contact**

a. The local district or area office of the Department of Natural Resources shall be contacted 48 hours in advance of the intended date of well grouting.

LIMESTONE WELL - LESS THAN 60 FEET OF OVERBURDEN



NOTE: THE INNER 6-INCH CASING MUST BE SEATED INTO FIRM ROCK.

REFER TO SUBCHAPTER III OF NR 811 FOR DETAILED REQUIREMENTS.

NOTE: AN OUTER WELL CASING MAY BE USED IN CONSTRUCTION

State of Wisconsin
Department of Natural Resources
PO Box 7921, Madison WI 53707-7921
dnr.wi.gov

Well Pump Submittal Checklist

Form 3300-226 (R 11/15)

Notice: This form is authorized by ss. 280.11, 281.11 and 281.19 (1) and (2), Wis. Stats., and ss. NR 108.04 (2)(a) and 811.08 (1), Wis. Adm. Code. Completion of this form or a similar form approved by the DNR is mandatory. Personal information collected will be used for administrative purposes and may be provided to requesters to the extent required by Wisconsin's Open Records Law [ss. 19.31-19.39, Wis. Stats.]. Unless otherwise noted all citations refer to Wis. Adm. Code.

Water System Name	Well Number(s)
Quarry Bluff	001 & 002

Project Name

Quarry Bluff

A. Submittal Information

1. Is a copy of the well constructor's report included? (s. NR 811.12(3)) ○ Yes ○ No ◉ N/A
2. Is a copy of the pumping test data included? (s. NR 811.12(16)) ○ Yes ○ No ◉ N/A
3. Is a copy of the plumbness and alignment test data included? (s. NR 811.12(15)) ○ Yes ○ No ◉ N/A
4. Are copies of the following analyses included: (ss. NR 811.12(19) & (20)) ◉ N/A
   - Synthetic Organic analyses? ○ Yes ○ No
   - Inorganic analyses? ○ Yes ○ No
   - Volatile organic analyses? ○ Yes ○ No
   - Radioactivity analyses? ○ Yes ○ No
   - Bacteria analyses? ○ Yes ○ No
5. Are three copies of P.E. sealed specifications included? (s. NR 811.08) ◉ Yes ○ No ○ N/A
6. Is a copy of the pump curve included? ◉ Yes ○ No ○ N/A

B. Evaluation Information

1. Was the well constructed or reconstructed in accordance with the approval? (s. NR 108.03(3)) ○ Yes ○ No ◉ N/A
   If no, attach an explanation for the infield changes.
2. Does the well meet plumbness and alignment standards? (s. NR 811.12(15)) ○ Yes ○ No ◉ N/A
3. Does the water quality meet the primary and secondary drinking water standards contained in chapter NR 809, Wis. Adm. Code? ○ Yes ○ No ◉ N/A
   If no, attach an explanation of the proposed solution to the water quality problem(s).
4. Are there detectable levels of synthetic organic or volatile organic chemicals in the water? (ch. NR 809) ○ Yes ○ No ◉ N/A
   If yes, provide an assessment of the contamination source and the potential for these levels to increase with time or with increased pumping of the well.
5. Is the well pump to be provided with a source of emergency power? (s. NR 811.27) ○ Yes ◉ No ○ N/A
   If no, provide a justification for the lack of emergency power at this station.
   Not a municipal system
6. To where will the well pump discharge? (s. NR 811.09(1)(f)) Pumphouse and then to a private watermain serving the development
7. Will the design of the pump base comply with (s. NR 811.31(1) or s. NR 811.32(1)) ○ Yes ○ No ◉ N/A
8. Will the well and pump be disinfected in accordance with AWWA C654 prior to placing the well into service? (s. NR 810.09(4)) ◉ Yes ○ No
9. Will bacteriologically safe samples be obtained? (s. NR 810.09(4)(b)) ◉ Yes ○ No

VERTICAL TURBINE PUMPS ONLY

10. Will the pump be water lubricated? (s. NR 811.31(2)) ○ Yes ○ No ○ N/A
    a. If no, provide a justification for oil lubrication.

    b. If no, will the oil be a NSF/ANSI Standard 61 certified mineral oil? ○ Yes ○ No ○ N/A
    c. Will prelubrication be provided? ○ Yes ○ No
    d. Will any prelubrication line be solenoid controlled? ○ Yes ○ No ○ N/A
    e. Will any water prelubrication line be metered? ○ Yes ○ No ○ N/A

Well Pump Submittal Checklist

Form 3300-226 (R 11/15)

C. Specifications (s. NR 811.09(2))

Type of pump: Submersible

Pump setting depth (to top of bowls): 300 ft.

Pump manufacturer and model number: Grundfos Model 85S

Motor horsepower: 15

Pump RPM: Variable

Type of Auxiliary Power: _____

Type of Backspin Protection: _____

Design Pump Capacity: 85 GPM at 384 feet TDH

D. Calculations (s. NR 811.09(2))

Pump Setting Calculation

Pump Setting = (Pumping Rate/Specific Capacity) + Safety Factor + Static Water Level

P.S. = (_____ / _____) + _____ + _____ feet

P.S. = _____ feet

Motor Horsepower Calculation

Minimum Motor Horsepower = (Pumping Rate X TDH) / (3960 X efficiency)

Minimum Hp = (85.00 X 384.00) / 3960 X 0.70)

Minimum HP = 11.77

Design HP = 11.77

E. Pump Variable Output Control Devices (s. NR 811.34)

1. Will a pump variable output control device be installed? (●) Yes ( ) No
   If yes, answer the following questions:
2. What type of pump variable output control device will be installed? (Include make and model number)
   Grundfos CUE
3. What is the purpose(s) for which the pump variable output control device will be used?
   To provide constant pressure at various flow rates to a 117 unit development.
4. Will the GPM pump capacity meet the peak demand rate? (s. NR 811.34(1)) (●) Yes ( ) No ( ) N/A
5. Will a pump motor high pressure cut-out switch be installed? (s. NR 811.34(2)) (●) Yes ( ) No ( ) N/A
6. Will a pressure relief valve be installed on the pump discharge piping? (s. NR 811.34(3)) (●) Yes ( ) No ( ) N/A
7. Will a redundant means of controlling the pump motor be installed? (s. NR 811.34(4)) (●) Yes ( ) No ( ) N/A
8. Will proportional flow pacing be provided for any chemical feed pump(s) wired to run in series with the pump motor? (s. NR 811.34(5)) (●) Yes ( ) No ( ) N/A
9. Will adequate storage be provided on the discharge side of the pump? (s. NR 811.34(6)) (●) Yes ( ) No ( ) N/A

   If yes, describe Two Well-X-Trol WX-350D pressure tanks provide 2.5 times the pumping rate worth of storage will be provided.

   If yes, what means will be provided to prevent water from becoming stagnant in a pressure tank(s) if applicable? (s. NR 811.34(6)(e))
   The VFD controller maintains a set pressure of 55 psi. The default setting in the stop/start mode of the controller provides for a 7 psi drop before the pump actually starts. This initial demand will therefore be drawn out of the pressure tank when water is required.
10. Will forced air ventilation be provided for the room where the pump variable output control devices will be located? (s. NR 811.34(7)) ( ) Yes (●) No ( ) N/A
11. Will the pump variable output control device be installed in a corrosive environment? (s. NR 811.34(8)) ( ) Yes (●) No ( ) N/A
12. Will the pump variable output control device be installed in a room with dehumidification or air conditioning? (s. NR 811.34(9)) ( ) Yes (●) No ( ) N/A

    If yes, describe _____

Well Pump Submittal Checklist
Form 3300-226 (R 11/15) Page 3 of 3

F. Comments:

Certification

I certify that I have examined the above information and found it to be correct, true and complete.

Signature of Professional Engineer **or** Licensed Pump Installer		Date Signed	
Steven J. Parent		11-7-19	
Printed Name of Professional Engineer **or** Licensed Pump Installer		Wisconsin P.E. **or** Licensed Pump Installer Number	
Steven J. Parent, P.E.		E-25577	
E-mail Address	Cell Number (include area code)	Phone Number (include area code)	Fax Number (include area code)
sparent@baudhuin.com	(920) 421-1413	(920) 743-8211	

Quarry Bluff
OTM Wells # 001 & # 002 Application
Additional Well Data

Peak Well Demand Calculation

Well serves 117 units. Peak water demand is calculated as follows:

117 units x 2.5 people/unit x 70 gpd/person = 20,475 gpd average
Assume water use occurs over an 8-hour period = 20,475 ÷ 8 = 2,559 gph
Assume peak demand = 4 x average demand
Peak demand = 2,569 gph x 4= 10,236 gph ÷ 60 min/hr = 170 gpm
Service is provided by 2 wells = 170 gpm ÷ 2 = 85 gpm peak demand

Total Dynamic Head Calculation

TDH = Elevation Head + Friction Head Loss + Pressure Head

Elevation Head = difference between pumping level & pressure tank
= 200 ft

Pump to Pressure tank = 300 ft of 2" plastic pipe
Friction loss in 2" pipe at 85 gpm = 17.3 ft/100 ft
Assume fittings = 10% of total pipe friction or 30 ft.
Therefore friction loss =
300 ft x 17.3 ft/100 ft = 51.90 ft.
30 ft x 17.3 ft/100ft = 5.19 ft.
Total friction loss = 57.09 ft.

Pressure Head = pump set point converted to feet = 55 psi x 2.31 ft/psi
= 127.05 ft

Therefore, at 85 gpm, the TDH = 200.00 + 57.09 + 127.05 = 384.14 ft.

STANDARD WELL PUMP AND DISCHARGE PIPING SPECIFICATIONS

1. Pump Installer Qualifications

   a. The pump installer shall be a licensed installer registered in the State of Wisconsin under Chapter NR 146, Wis. Adm. Code.

2. Well Pump

   a. Type - The well pump shall be a submersible pump.

   b. Materials - The materials of the pump shall be resistant to the corrosive nature of the water and shall not contain lead.

   c. Lubrication - The pump shall be water lubricated.

   d. Pump Column/Drop Pipe - The pump column or drop pipe shall be steel. Plastic drop pipe shall not be used.

   e. Motor - The motor shall be an electrical motor. The pump motor lubricant or coolant oil shall be an FDA approved white mineral oil, National Formulary, inhibited propylene glycol with FDA approved components, or shall be specifically approved by the Private Water Supply Section of the Department of Natural Resources.

3. Pump Discharge

   a. The pump shall discharge above grade. Submersible pumps shall discharge through a sanitary well seal or plate. Pitless adapters shall not be used.

   b. Water Level Measurement - The well shall be equipped with an airline with altitude gauge for measuring water levels.

   c. Venting - The well shall be equipped with a 24-mesh noncorrodible screened well vent that terminates in a "U"-bend a minimum of 24-inches above the pumphouse floor.

4. Well Discharge Piping

   a. Materials - The well discharge piping within the well house shall be cast iron, ductile iron, copper, or galvanized steel. Plastic pipe shall not be installed within the well house. All discharge piping from the well including the distribution system shall meet the requirements of IHLR 84.

5. Well Discharge Piping Appurtenances

   a. Meter - The well discharge line shall be provided with a space to install a totalizing water meter prior to the first pressure tank if required by the Department at a later date.

   b. Check Valve - A check valve shall be installed in the above grade well discharge piping in addition to any at the top of the submersible pump within the pump column.

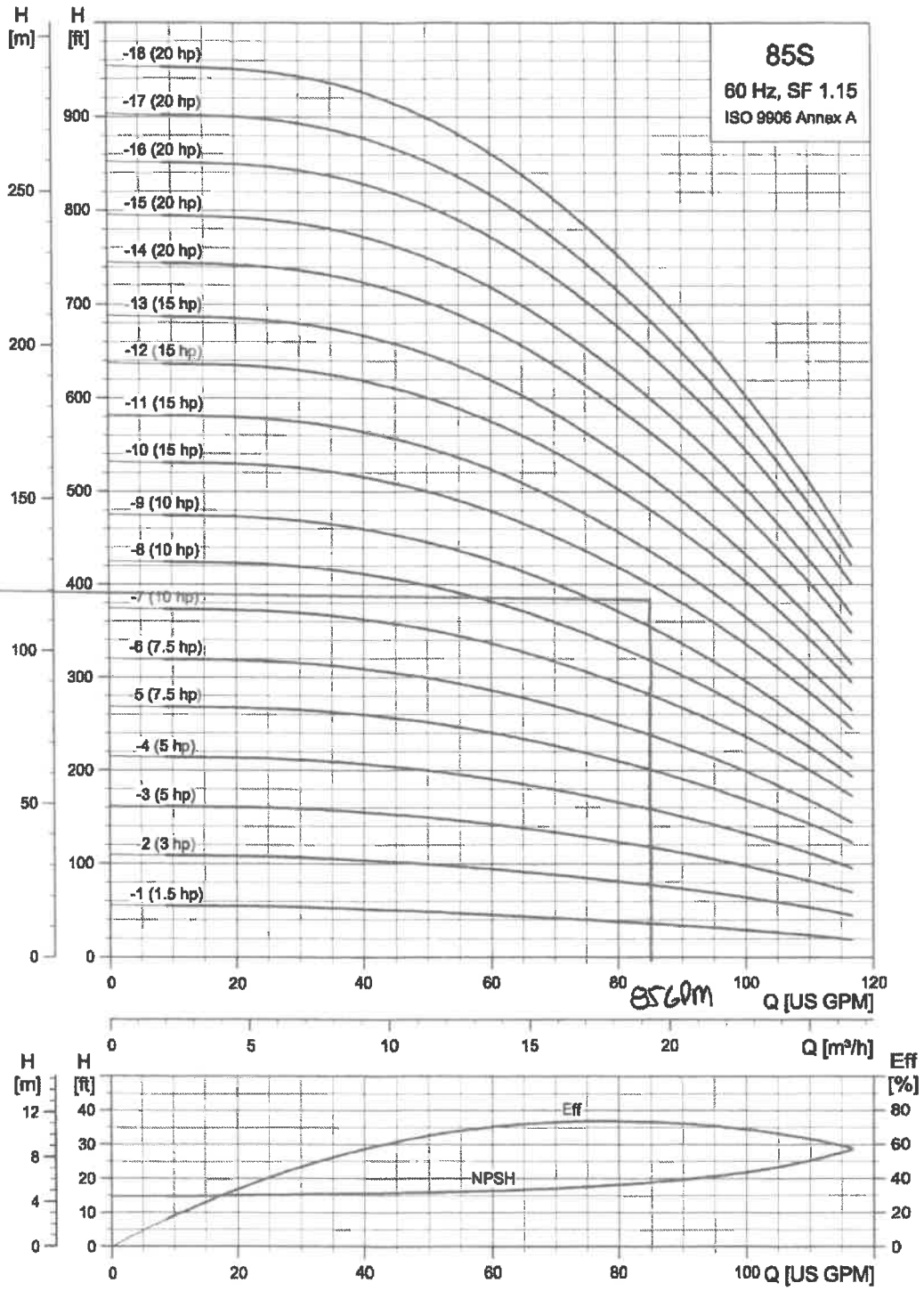
   c. Sample Faucet - A smooth end sample faucet shall be installed on the discharge piping.

   d. Pressure Gauge - A pressure gauge shall be installed on the discharge piping.

   e. Shut-off Valve - A gate valve or other suitable shut-off valve shall be installed on the discharge piping.

   f. Pressure Switch - A pressure switch for controlling the pump operation shall be installed and its location shown on the plans.

6" and larger wells
SP 85S (85 gpm)



384' TDH

85 GPM

TM05 0235 1812

State of Wisconsin
Department of Natural Resources
Bureau of Drinking Water and Groundwater, DG/5
PO Box 7921, Madison WI 53707-7921
dnr.wi.gov

Pump Discharge Line Submittal Checklist

Form 3300-296 (R 04/16)

Notice: This form is authorized by ss. 280.11, 281.11, 281.19 (1) and (2), and 281.41, Wis. Stats., and ss. NR 108.04 (2)(a) and 811.08 (1), Wis. Adm. Code. Completion of this form or a similar form approved by the Department of Natural Resources (DNR) is mandatory. Personal information collected will be used for administrative purposes and may be provided to requesters to the extent required by Wisconsin's Open Records Law [ss. 19.31-19.39, Wis. Stats.]. Unless otherwise noted all citations refer to Wis. Adm. Code.

Water System General Information

Water System Name	Well Number(s)
Quarry Bluff	001 & 002

Project Name

Quarry Bluff

Purpose of Installation: (select all that apply)

☒ Well pump discharge ☐ Pitless unit discharge ☐ Low-lift pump discharge ☐ High-lift pump discharge ☐ Booster pump discharge

☐ Other

General Information (ss. NR 811.37(1), (2) & (3))

1. Will any portion of the pump discharge piping be buried? ○ Yes ◉ No

   a. If yes, will adequate positive pressure be maintained on the buried piping at all times? ○ Yes ○ No

   b. If yes, and adequate positive pressure will **not** be maintained on the buried piping at all times, what means will be provided to maintain adequate positive pressure at all times? (It is recommended that the means to be provided be discussed with a DNR plan review engineer before sending in the submittal.)

2. Indicate the diameter and pipe material specifications for all above and below grade pump discharge piping as applicable. (ss. NR 811.28(5)(b) & NR 811.37(2))

   3" Galavanized

3. Will the portion of the pump discharge piping containing the appurtenances be located above grade? ◉ Yes ○ No

   If no, has the DNR been contacted to discuss any variance to this requirement? ○ Yes ○ No

   DNR Contact Person Name: _____ Phone Number: _____

Installation Details (ss. NR 811.31, NR 811.32 & NR 811.37(4)&(5)) Note: Refer to Figure Nos. 7,8 & 9 in the Appendix of ch. NR 811.

4. Has a drawing(s) of the pump base/pump head showing details and dimensions been attached? ◉ Yes ○ No

5. Has a drawing(s) of the pump discharge piping showing the locations and details of all appurtenances on the piping been attached? ◉ Yes ○ No

6. Will the following pump discharge piping appurtenances be installed?
   NOTE: DNR can be contacted prior to plan submittal to discuss modifications or additions to the above sequence of appurtenances as appropriate.

   a. Pump-to-waste fitting or hydrant? ◉ Yes ○ No ○ N/A

   If a hydrant will be used to pump to waste, describe how and where.

Pump Discharge Line Submittal Checklist

Form 3300-296 (R 04/16)

b. Air-vacuum relief valve? (●) Yes ( ) No ( ) N/A

If yes, the discharge piping from the valve will be metal, will face downward and terminate a minimum of 24 inches above the floor with a 24-mesh corrosion resistant screened opening? (●) Yes ( ) No ( ) N/A

c. Smooth-end metal raw water sampling faucet? (●) Yes ( ) No ( ) N/A

d. Check valve? (●) Yes ( ) No ( ) N/A

If yes, type of check valve to be installed: swing check valve

e. Water meter? (●) Yes ( ) No ( ) N/A

If yes, type of water meter to be installed: positive displacement mechanical flow meter

Will the water meter be capable of proportionally flow pacing one or more chemical feed pumps? (●) Yes ( ) No ( ) N/A

f. Shut-off valve? (●) Yes ( ) No ( ) N/A

If yes, type of shut off valve to be installed: gate valve

g. Pressure gauge? (●) Yes ( ) No ( ) N/A

h. Chemical injection tap(s)? (●) Yes ( ) No ( ) N/A

i. Point-of-entry smooth end metal sampling faucet? (●) Yes ( ) No ( ) N/A

7. Is a pitless unit being installed? (s. NR 811.35 & Figure No. 7 in the Appendix of ch. NR 811) ( ) Yes (●) No

If yes, has the installation of the appurtenances on the pump discharge piping been adjusted accordingly? ( ) Yes ( ) No

8. Will the connecting piping to one or more pressure tanks be tied into the pump discharge piping? (●) Yes ( ) No

a. If yes, has the DNR been contacted to discuss the specific installation location and requirements for the pressure tank(s)? ( ) Yes (●) No

DNR Contact Person Name _____ Phone Number _____

b. If yes, has a Pressure Tank Submittal Checklist (DNR Form No. 3300-299) been completed and attached to this submittal? ( ) Yes ( ) No

Comments

Certification

I hereby certify that the above information and attachments are accurate and complete to the best of my knowledge.

Printed Name of Professional Engineer/Consultant	Company Name	Date Signed
Steven J. Parent, P.E.	Baudhuin Incorporated	11-7-16
Signature of Professional Engineer/Consultant	**Wisconsin P.E. Number (if applicable)**	
Steven J. Parent	E-25577	

Email Address	Cell Phone # (incl. area code)	Alt Phone # (incl. area code)	Fax # (incl. area code)
sparent@baudhuin.com	(920) 421-1413	(920) 743-8211	

NOTE: Plan submittal by a P.E. is not required for water treatment improvements to be constructed at other-than-municipal community water systems unless seven (7) or more homes are being served (a subdivision water system).

State of Wisconsin
Department of Natural Resources
Bureau of Drinking Water and Groundwater, DG/5
PO Box 7921, Madison WI 53707-7921
dnr.wi.gov

Pressure Tank Submittal Checklist

Form 3300-299 (R 04/16)

Notice: This form is authorized by ss. 280.11, 281.11, 281.19 (1) and (2), and 281.41, Wis. Stats., and ss. NR 108.04 (2)(a) and 811.08 (1), Wis. Adm. Code. Completion of this form or a similar form approved by the Department of Natural Resources is mandatory. Personal information collected will be used for administrative purposes and may be provided to requesters to the extent required by Wisconsin's Open Records Law [ss. 19.31-19.39, Wis. Stats.]. Unless otherwise noted all citations refer to Wis. Adm. Code.

A. Water System General Information

Water System Name	Well Number(s)
Quarry Bluff	001 & 002

Project Name

Quarry Bluff

B. Pressure Tank Specifications (s. NR 811.61)

1. Manufacturer

Well-X-Trol

2. Model Number	3. Gross Volume (gallons)	4. Number of tanks to be installed
WX-350	119	2

5. Means for controlling pump operation

Variable speed drive electronic controls

6. Is each tank capable of being bypassed for maintenance, repair, or replacement? (s. NR 811.61(2)) — (●) Yes ( ) No

7. Will each tank be stamped or labeled showing the manufacturer's name, a serial number, the tank volume, the allowable working pressure and the year fabricated? (s. NR 811.61(8)) — (●) Yes ( ) No

8. Are the tank(s) equipped with a bladder or have a gross tank volume <500 gallons? — (●) Yes ( ) No

If yes:

a. Is the bladder material NSF/ANSI standard 61 certified? (s. NR 810.09(5)) — (●) Yes ( ) No ( ) N/A

b. If the tank has an individual connecting pipe, will the connecting pipe be fitted with a shut-off valve, pipe union and drain fitting? (s. NR 811.61(2)) — (●) Yes ( ) No ( ) N/A

c. Will each tank be equipped with an air inlet fitting to allow manual air addition? (s. NR 811.61(6)) — (●) Yes ( ) No

d. Will each tank or bank of tanks be provided with a pressure relief valve? (s. NR 811.61(6)) — (●) Yes ( ) No

If no bladder and the gross tank volume is ≥ 500 gallons: (ss. NR 811.61(3),(4), (5) & (9))

e. Will the tank have a drain fitting with shut-off valve? — ( ) Yes ( ) No

f. Will the tank have a pressure gauge? — ( ) Yes ( ) No

g. Will the tank have a pressure relief valve? — ( ) Yes ( ) No

h. Will the tank have an air relief valve? — ( ) Yes ( ) No

i. Will the tank have a water-sight glass? — ( ) Yes ( ) No

j. Will the tank interior be painted? — ( ) Yes ( ) No

If yes, list the paint specifications:

If yes, are the interior paints NSF/ANSI Standard 61 certified? — ( ) Yes ( ) No

k. Will the tank be provided with an air compressor to add air? — ( ) Yes ( ) No

If yes, will the operation of the air compressor be automatically controlled? — ( ) Yes ( ) No

If yes, will the air compressor be oil-less? — ( ) Yes ( ) No

l. Will the tank be constructed of steel and have a minimum 0.25-inch minimum side-wall and head-wall thickness? — ( ) Yes ( ) No

Pressure Tank Submittal Checklist

Form 3300-299 (R 04/16)

C. Installation Location (s. NR 811.61(1))

9. Will the pressure tank(s) be located (●) above grade or ( ) below grade?

10. Describe all security measures to be provided for the installation where the pressure tank(s) will be housed:
Installed in a lockable building

11. Will room heating equipment be installed?	(●) Yes	( ) No	( ) N/A
12. Will room ventilation equipment be installed?	( ) Yes	(●) No	( ) N/A
13. Will dehumidification equipment be installed?	( ) Yes	(●) No	( ) N/A

14. If above grade, describe how and where the pressure tank(s) will be housed:
pressure tanks will be housed above grade in a lockable heated building.

15. If below grade, describe how and where the pressure tank(s) will be housed and select all that apply:

a. Will the pressure tank(s) will be partially buried with head end exposed?	( ) Yes	( ) No	( ) N/A
b. Will the pressure tank(s) will be totally exposed?	( ) Yes	( ) No	( ) N/A

16. If in a vault:

a. Will all electrical controls be installed above grade?	( ) Yes	( ) No	( ) N/A
b. Will any air or pressure relief valve discharge piping terminate above grade with a down-turned U-bend and the pipe opening covered with a 24-mesh corrosion resistant screen?	( ) Yes	( ) No	( ) N/A
c. Will any floor, wall or roof penetrations for piping, conduit, etc., be sealed watertight?	( ) Yes	( ) No	( ) N/A
d. Will any access manhole terminate ≥ 24 inches above grade?	( ) Yes	( ) No	( ) N/A
e. Will any access manhole have an overlapping, shoe-box-type cover with gasket?	( ) Yes	( ) No	( ) N/A
f. Will any metal air vent piping terminate ≥ 24 inches above grade with a down-turned U-bend and the pipe opening covered with a 24-mesh corrosion resistant screen?	( ) Yes	( ) No	( ) N/A
g. Will a sump with sump pump discharging to grade be installed?	( ) Yes	( ) No	( ) N/A

17. If in a basement:

a. Will the basement have an outward opening door that will open to grade?	( ) Yes	( ) No	( ) N/A
b. Will a floor drain be installed? If yes, the floor drain will discharge to:	( ) Yes	( ) No	( ) N/A
c. Will a sump with sump pump discharging to grade be installed?	( ) Yes	( ) No	( ) N/A

D. Gross Storage Volume (ss. NR 811.34(6) & NR 811.61(7))

18. The pump on/off controls will be conventional even if a variable frequency drive (VFD) unit will be installed and therefore the total gross pressure tank storage volume in gallons will be a minimum of 10 times the average pump capacity in gallons per minute. (s. NR 811.61(7))	( ) Yes	(●) No	( ) N/A
19. The pump output will be variable due to control by a variable frequency drive (VFD) unit and therefore the total gross pressure tank storage volume in gallons will be a minimum of 2.5 times the average pump capacity in gallons per minute. (s. NR 811.34(6)(a))	(●) Yes	( ) No	( ) N/A
20. The pump output will be variable due to control by a control valve installed on the pump discharge piping and therefore the total gross pressure tank storage volume in gallons will be a minimum of 5 times the average pump capacity in gallons per minute. (s. NR 811.34(6)(b))	( ) Yes	(●) No	( ) N/A
21. The pump is a booster pump or a high-lift pump discharging to a distribution system without elevated storage, a variable frequency drive unit or a control valve on the pump discharge piping will be installed to vary the pump output to maintain a set distribution system pressure and therefore the total gross pressure tank storage volume in gallons will be a minimum of 2.5 times the average pump capacity in gallons per minute. (s. NR 811.34)(6)(c))	( ) Yes	(●) No	( ) N/A

Pressure Tank Submittal Checklist

Form 3300-299 (R 04/16)

E. Comments

F. Certification

I hereby certify that the above information and attachments are accurate and complete to the best of my knowledge.

Printed name of Professional Engineer/Consultant	Company Name	Date Signed
Steven J. Parent, P.E.	Baudhuin Incorporated	11-7-16
Signature of Professional Engineer/Consultant	Wisconsin P.E. Number (if applicable)	
	E-25577	

Email Address	Cell Phone # (incl. area code)	Alt Phone # (incl. area code)	Fax # (incl. area code)
sparent@baudhuin.com	(920) 421-1413	(920) 743-8211	

NOTE: Plan submittal by a P.E. is not required for water treatment improvements to be constructed at other-than-municipal community water systems unless seven (7) or more homes are being served (a subdivision water system).

AMTROL

WELL-X-TROL®

Diaphragm Well Tanks: WX-100, 200 and 300 Series

150 PSIG Working Pressure

Construction

Shell	High Strength Steel
Diaphragm	Heavy Duty Butyl
Liner	Polypropylene
System Connection	Stainless Steel
Finish	Tuf-Kote™ HG Blue
Water Circulator	Turbulator™
Air Valve	Projection Welded
Factory Precharge	38 PSIG (2.6 bar)

Performance

Maximum Operating Temperature	200°F (93°C)
Maximum Working Pressure	150 PSIG (10.3 bar)
Maximum Relief Valve Setting	125 PSIG (8.6 bar)
Warranty	7 Year

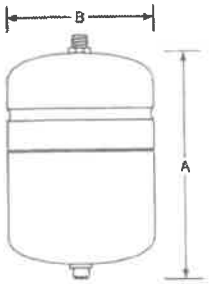
Application

- Controls pump cycling in residential well water systems.
- Can be installed indoors or outdoors.

In-Line Models

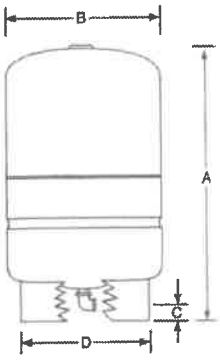
Model Number	Tank Volume		Max. Acceptance Factor	A Tank Height		B Tank Diameter		System Connection (NPTM)	Shipping Weight	
	Gal	Lit		In	mm	In	mm	In	Lbs	Kg
WX-101	2.0	8	0.45	13	330	8	203	¾	5	2
WX-102	4.4	17	0.55	15	381	11	279	¾	9	4
WX-103	7.6	29	0.43	22	559	11	279	¾	15	7
WX-104	10.3	39	1.00	18	457	15	381	1	20	9
WX-200	14.0	53	0.81	22	559	15	381	1	22	10

Available in gray. Use suffix G.



Stand Models

Model Number	Tank Volume		Max. Accept. Factor	A Tank Height		B Tank Diameter		C Sys. Conn. Centerline		D Stand Diameter		System Conn. (NPTM)	Shipping Weight	
	Gal	Lit		In	mm	In	mm	In	mm	In	mm	In	Lbs	Kg
WX-201	14.0	53	0.81	25	635	15	381	1 19/32	40	12	304	1	25	11
WX-202	20.0	76	0.57	32	813	15	381	1 19/32	40	12	304	1	33	15
WX-202XL	26.0	98	0.44	39	991	15	381	1 19/32	40	12	304	1	36	16
WX-203	32.0	121	0.35	47	1194	15	381	1 19/32	40	12	304	1	43	20
WX-205	34.0	129	1.00	30	762	22	559	1 15/16	49	20½	521	1¼	61	28
WX-250	44.0	167	0.77	36	914	22	559	1 15/16	49	20½	521	1¼	69	31
WX-251	62.0	235	0.55	47	1194	22	559	1 15/16	49	20½	521	1¼	92	42
WX-255	81.0	306	0.41	57	1448	22	559	1 15/16	49	20½	521	1¼	103	47
WX-252*	86.0	326	0.39	62	1575	22	559	1 15/16	49	20½	521	1¼	114	52
WX-302	86.0	326	0.54	47	1194	26	660	2 1/16	52	20½	521	1¼	123	56
WX-350	119.0	450	0.39	62	1575	26	660	2 1/16	52	20½	521	1¼	166	75



*WX-252: Maximum Working Pressure: 100 PSIG. Available in Blue only. Available in Tan and Gray. Use suffix T or G.

All dimensions and weights are approximate.

Job Name _____ Notes _____

Engineer _____

Contractor _____

P.O. No. _____

Sales Rep. _____

Model No. _____

NSF CERTIFIED TO NSF/ANSI 61

MADE IN USA

LOW-LEAD IAPMO Pert

Amtrol Inc., 1400 Division Road, West Warwick, RI 02893 USA T: 401.884.6300 www.amtrol.com

MC 4400 (01/14)

State of Wisconsin
Department of Natural Resources
Bureau of Drinking Water and Groundwater, DG/5
PO Box 7921, Madison WI 53707-7921
dnr.wi.gov

Pumping Stations, Pumphouses, and Water Treatment Plant Buildings Submittal Checklist

Form 3300-304 (R 02/19)

Notice: This form is authorized by ss. 280.11, 281.11, 281.19 (1) and (2), and 281.41, Wis. Stats., and ss. NR 108.04 (2)(a) and 811.08 (1), Wis. Adm. Code. Completion of this form or a similar form approved by the Department of Natural Resources (DNR) is mandatory. Personal information collected will be used for administrative purposes and may be provided to requesters to the extent required by Wisconsin's Open Records Law [ss. 19.31-19.39, Wis. Stats.]. Unless otherwise noted all citations refer to Wis. Adm. Code.

A. Water System Information

Water System Name	Well Number(s), if applicable
Quarry Bluff	001 & 002

Project Name

Quarry Bluff

B. Project Location

Describe the project location:

117 unit motor coach development. Development is located on a 49 acre site in the Town of Sevastopol.

C. Construction Details (ss. NR 811.24 & NR 811.25)

1. Will the uses of the building be compatible with the protection of the water supply? (s. NR 811.24) — (●) Yes ( ) No
2. Will adequate space be provided for the installation and servicing of all existing and possible future equipment in the building? (s. NR 811.25(1)(a)) — (●) Yes ( ) No
3. Building dimensions: 10' x 10'
4. Describe the building floor, wall, and roof materials and the building construction details: (s. NR 811.25(1)(b))
   Concrete slab floor, 2x4 construction, wood siding with vinyl coated aluminum trim and shingled roof.
5. Will the exterior walls and the roof be insulated? (s. NR 811.25(1)(b)) — (●) Yes ( ) No
6. Will exterior building door(s) open outward? (s. NR 811.25(1)(c)) — (●) Yes ( ) No
7. Security measures provided *(select all that apply)*: (s. NR 811.25(1)(c))
   - [x] Lockable access door
   - [ ] Security fencing
   - [ ] Police or security service patrol
   - [ ] Intrusion alarm(s)
   - [x] Lighting
   - [ ] Security measures connected to a SCADA system

   Briefly describe any other security measures that will be provided for this structure:
8. Elevation information (s. NR 811.25(1)(d))
   a. Will the ground grade be sloped to drain away from the building? — (●) Yes ( ) No ( ) N/A
   b. Will the floor elevation be ≥ 6 inches above the finished grade? — (●) Yes ( ) No ( ) N/A
   c. Will the floor elevation be ≥ 2 feet above the regional flood elevation? — (●) Yes ( ) No ( ) N/A
   d. Will year round dry land access be provided? — (●) Yes ( ) No ( ) N/A
9. Will the building be provided with a concrete floor(s)? (s. NR 811.25(1)(g)) — (●) Yes ( ) No
   If yes, will the concrete be reinforced with rebars? — (●) Yes ( ) No
   If yes, indicate the floor thickness in inches. 4"

Pumping Stations, Pumphouses, and Water Treatment Plant Buildings Submittal Checklist

10. Will the floor(s) be provided with one or more floor drains? (s. NR 811.25(1)(h)) (●) Yes ( ) No

If yes:

a. The floor drain wastewater piping will discharge to:

- ( ) A sanitary sewer
- (●) The ground surface
- ( ) A holding tank
- ( ) A POWTS system
- ( ) Other _____

b. Review the code requirements and provide a summary of how and to where any floor drains will discharge.
Floor drain discharge will be located at least 25 feet from the pumphouse and the invert will be at least 6 inches below the floor grade.

c. If floor drains will discharge to a sanitary sewer, will the building floor elevation be at least one foot above the rim elevation of the nearest upstream sanitary sewer manhole? (s. NR 811.25(1)(h)2.a.) ( ) Yes ( ) No (●) N/A

d. Will any floor or hub drain and any floor or hub drain piping, accepting water from only pump gland drainage, a pressure relief valve or control valve, a sampling faucet, or the floor, be located ≥ 2 feet from any outer well casing or the well grout seal? (●) Yes ( ) No ( ) N/A

e. Will any floor drain and floor drain piping, accepting blackwater or graywater, be located ≥ 8 feet from any outer well casing or the well grout seal? ( ) Yes ( ) No (●) N/A

f. Provide the pipe diameter and pipe specifications for the floor drain wastewater piping.
4" PVC Sch 80 pipe.

If no, will the floor be sloped to drain to the door? ( ) Yes ( ) No ( ) N/A

11. Will heat be provided? (s. NR 811.25(4)) (●) Yes ( ) No
If yes, describe:
Electric baseboard.

12. Will room ventilation be provided? (s. NR 811.25(5)) ( ) Yes (●) No
If yes, describe:

13. Will dehumidification or air conditioning equipment be provided? (ss. NR 811.25(6) & NR 811.34(9)) (●) Yes ( ) No
If yes, describe:
Provisions will be made to allow the future addition of air conditioning equipment should the need arise.

14. Will lighting be provided? (s. NR 811.25(7)) (●) Yes ( ) No
If yes, describe interior and exterior lighting:
Single interior fixture & light switch.

15. Will all interior and exterior plumbing comply with Department of Safety and Professional Services requirements? (s. NR 811.25(8)) (●) Yes ( ) No ( ) N/A

16. Will the building be used for other purposes in addition to water supply? (s. NR 811.25(9)) ( ) Yes (●) No

If yes, has a DNR plan review engineer been contacted to discuss the other purposes? ( ) Yes ( ) No

DNR Contact Name	Phone Number

Pumping Stations, Pumphouses, and Water Treatment Plant Buildings Submittal Checklist

Form 3300-304 (R 02/19)

D. Auxiliary Power (ss. NR 811.12(5)(d)1. & NR 811.27

Will auxiliary power be installed? ○ Yes ◉ No

If yes, describe:

If yes, what will the auxiliary power source be capable of powering and not powering?

E. Resident Project Representative (s. NR 811.11)

On-site construction inspection is to be provided by:

Town Building Inspector

F. Comments

G. Certification

I hereby certify that the above information and attachments are accurate and complete to the best of my knowledge.

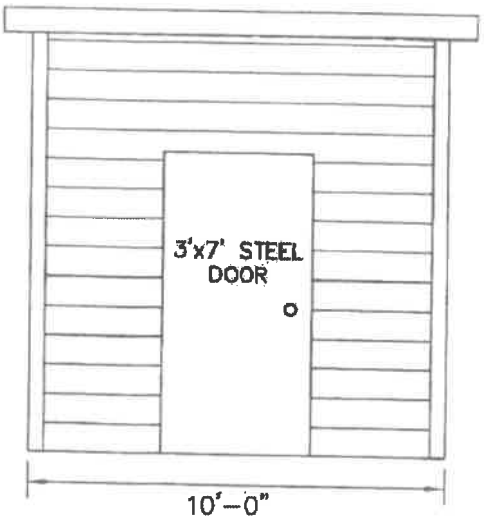
Printed Name of Professional Engineer/Consultant	Company Name	Date Signed
Steven J. Parent, P.E.	Baudhuin Incorporated	11-7-19
Signature of Professional Engineer/Consultant	Wisconsin P.E. Number (if applicable)	
Steven J. Parent	E-25577	

Email Address	Cell Phone # (incl. area code)	Alt Phone # (incl. area code)	Fax # (incl. area code)
sparent@baudhuin.com	(920) 421-1413	(920) 743-8211	

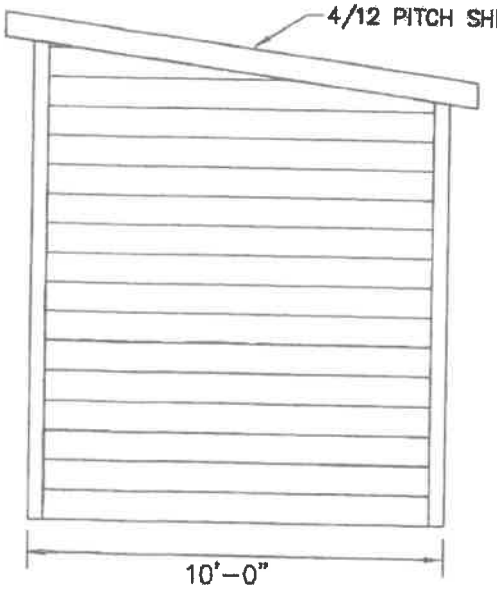
NOTE: Plan submittal by a P.E. is not required for new well construction at other-than-municipal community water systems unless seven (7) or more homes are being served (a subdivision water system).

Quarry Bluff Pump House Building Detail

NO SCALE



FRONT VIEW

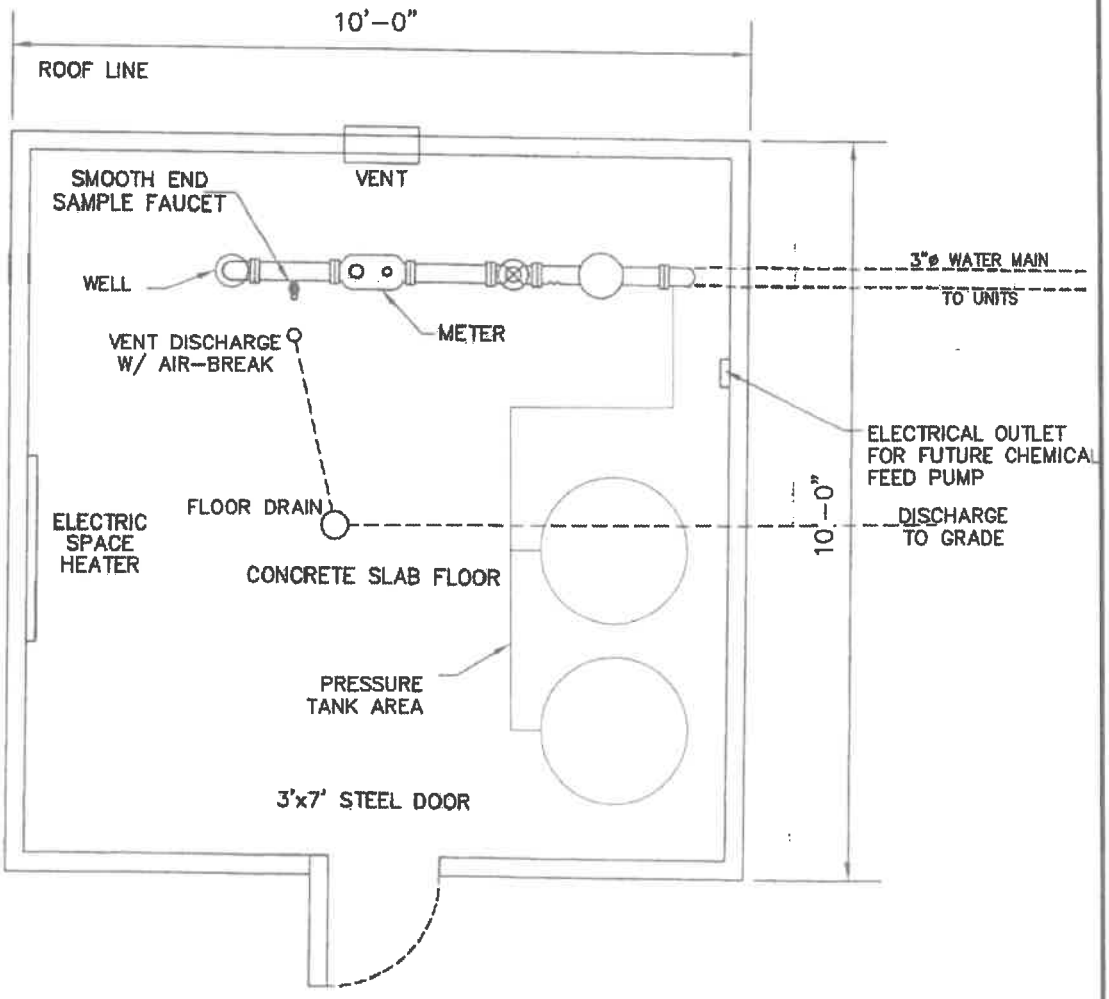


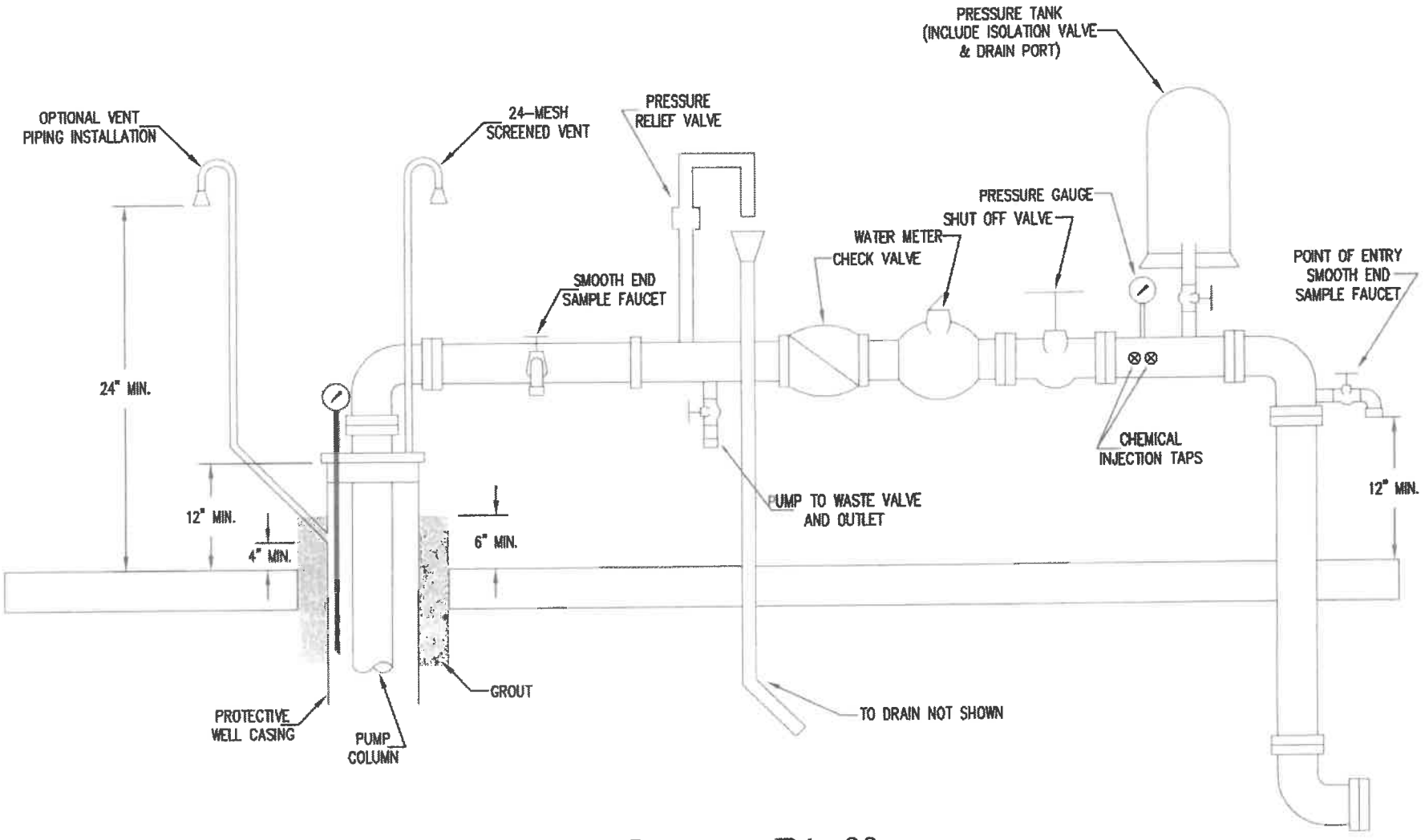
SIDE VIEW

Quarry Bluff Pump House Floor Plan

NO SCALE

- 2" x 4" WOOD FRAME CONSTRUCTION
- WOOD SIDING W/ VINYL COATED ALUMINUM TRIM
- 20-GA STEEL 3'x7' DOOR
- FRP R-11 INSULATION
- 4/12 PITCH SHED ROOF





Quarry Bluff
Pump House Piping Detail

CAD: Y:\dsb\LDWG\Dreutzer-Goetz 22061\dwg\061-WD

SHEET 3 OF 3

JOB NO. 22061
11-07-19

State of Wisconsin
Department of Natural Resources

PUBLIC WATER SUPPLY POTENTIAL CONTAMINANT USE INVENTORY

Form 3300-215 Rev. 01/2005

Facility Name:	System Type (Check One):	
Quarry Bluff	___ Municipal	_X_ Other than Municipal
	___ Nontransient Noncommunity	_X_ Transient Noncommunity

Facility I.D. Number:	Total Number of Wells:	Review Area:
	2	_X_ 1,200 ft radius ___ _____ ft CFR ___ ½ mile radius ___ 200 ft radius Other _____

Parts I and II of this form are authorized under ss. NR 809.12(2)(b), 809.21(3), and 809.25(5), Wis. Adm. Code, which pertain to sampling for drinking water contaminants. Completion of parts I and II of this form is required to apply for or extend monitoring waivers. Failure to complete this form upon request by the Department of Natural Resources may invalidate existing waivers or make the water system ineligible for new waivers and increase the number of samples required. Personally identifiable information requested on this form is likely to be used for purposes other than that for which it is originally being collected. DNR plans to make the information provided on this form available electronically on the Internet.

Instructions:

1. Look at a map of your water supply system to become familiar with the review area of each active well in your system.

2. On the map, indicate the location of all potential contaminant sources within the review area of each well by placing a circle with cross-hairs that best represents its actual location and label it with the appropriate map code listed below. **Example:** Place a circled cross-hair "⊕" and map code "CSS" on the map at the location of each gas service station. The number of "CSS" locations on the map should match the number of gas service stations indicated on this form. **Note:** Please confirm the locations already on the map. Make changes if necessary.

3. On this form, indicate how many of each potential contaminant source listed below is present within the review area of each well. **Example:** If 3 gas service stations are located within the review area of well No. 1, enter 3 in the row for "CSS" under the column for well No. 1. If there are no gas service stations located within the review area of well No. 1, leave the row blank for "CSS" under the column for well No. 1.

PART I: POTENTIAL CONTAMINANT SOURCES

		Well No. 001	Well No. 002	Well No. ___	Well No. ___	Well No. ___
	Unique Well I.D. Number --->					
CODE	POTENTIAL CONTAMINANT SOURCE					
	NONE					
	AGRICULTURE					
AFP	Agricultural farming					
AFA	Animal feedlot [5]					
AIA	Irrigation system					
AMS	Manure storage					
	BULK STORAGE/MATERIAL STOCKPILING					
BFS	Fertilizer storage / mixing (e.g. feed mill, ag. co-op) [3]					
BGS	Grain storage site [3]					
BPS	Pesticide storage/ mixing /loading (eg feed mill, ag co-op)[3]					
BFT	Petroleum storage (only include tanks 500 gal or more) [2]					
BCT	Chemical storage (only include tanks 500 gal or more) [1]					
BSS	Road salt storage (only include bulk storage sites)					
	COMMERCIAL					
CAI	Airport					
CBS	Auto body shop					
CBY	Boat yard					
CCW	Car wash (only include those in unsewered area)					
CCE	Cemetery					
CDC	Dry cleaning [2]					
CSS	Gas service station [2]					
CLD	Laundromat (only include those in unsewered area)					

	COMMERCIAL (cont.)					
CMW	Machine / metal working shop					
CVR	Motor vehicle repair shop					
CPS	Paint shop					
CPH	Photo processing (not retail stores, only include actual processing facilities)					
CMP	Plating facility (jewelry/metal)					
CPR	Printing					
CRY	Rail yard					
CRT	Railroad track [2]					
CSY	Scrap / junkyard					
CSP	Seed production plant [3]					
	GENERAL					
GFA	Fuel storage tank - above ground (non-service station) [2]					
GFB	Fuel storage tank - underground (non-service station) [2]					
GSL	Sewer line (municipal) [5]					
GSN	Sewer line (non-municipal) [5]	50 ft.	50 ft.			
GST	Sewage tank (holding tank, septic tank, sumps) [5]	1,800 ft.	360 ft.			
GSA	Sewage absorption area (drainfield, mound, dry well) [5]					
	INDUSTRIAL					
IAS	Asphalt plant					
ICM	Chemical production (only include large industrial facilities)					
IEE	Electrical and electronic products manufacturing					
IES	Electroplating / metal finishing facility [7]					
IFM	Furniture or wood manufacturing / refinishing / stripping					
IFW	Foundry / smelting plant [7]					
IGS	Gravel and sand pits					
IMQ	Mining Operation / mine waste					
IPM	Paper mill [6]					
IPP	Pipeline (petroleum or chemical)					
IPC	Plastics manufacturer / molder [4]					
ISQ	Stone quarries					
ITP	Textile / polyester manufacturer [4]					
IWT	Wood preserving facility [2,3]					
	MISCELLANEOUS SOURCES & CONDUITS					
MFT	Fire training facility					
MGC	Golf course					
MGP	Manufactured gas plant / gasification plant [3,7]					

	MISCELLANEOUS SOURCES & CONDUITS					
MLA	Laboratory (college, medical, school, private, etc.)					
MMP	Medical installation (e.g. hospital)					
MMI	Military installation [1]					
GWA	Water well (active production)					
GWI	Water well (unused or improperly abandoned) [3]					
MKF	Karst feature / fractured bedrock					
MOT	Other (specify) _____					
	WASTE MANAGEMENT					
WRP	ERRP Site [1]					
WHS	Hazardous waste generator (SARA Title III) / RCRA authority clean-ups [1]					
WIN	Incinerator (municipal)					
WDR	Class V injection well [3]					
WLA	Landfill / solid waste disposal [1]					
WLS	Leaking underground storage tank (LUST site) [2]					
WRF	Recycling facility					
WSS	Sludge spreading					
WTS	Solid waste transfer station					
WSW	Storm water retention pond	1,950 ft.	450 ft.			
WUC	Superfund site [1]					
WWP	Wastewater treatment plant					
WWO	Wastewater discharge to surface water					
WWS	Wastewater discharge to groundwater					
WSI	Wastewater spray irrigation					
WWL	Wastewater lagoon					

1 Affects all types of waiver 2 Affects VOC waiver 3 Affects SOC waiver 7 Affects cyanide waiver
4 Affects industrial chemical waiver 5 Affects microbial waiver 6 Affect Dioxin waiver

PART II: ASBESTOS AND COAL TAR (BENZO(A)PYRENE)

1. Is any part of your water distribution system constructed of materials containing asbestos fibers? (Example: Asbestos-cement pipe) __ Yes X No
2. Is any part of your water distribution system sealed with a product containing coal tar or Benzo(a)pyrene? (Example: Pipe or reservoir lining) __ Yes X No

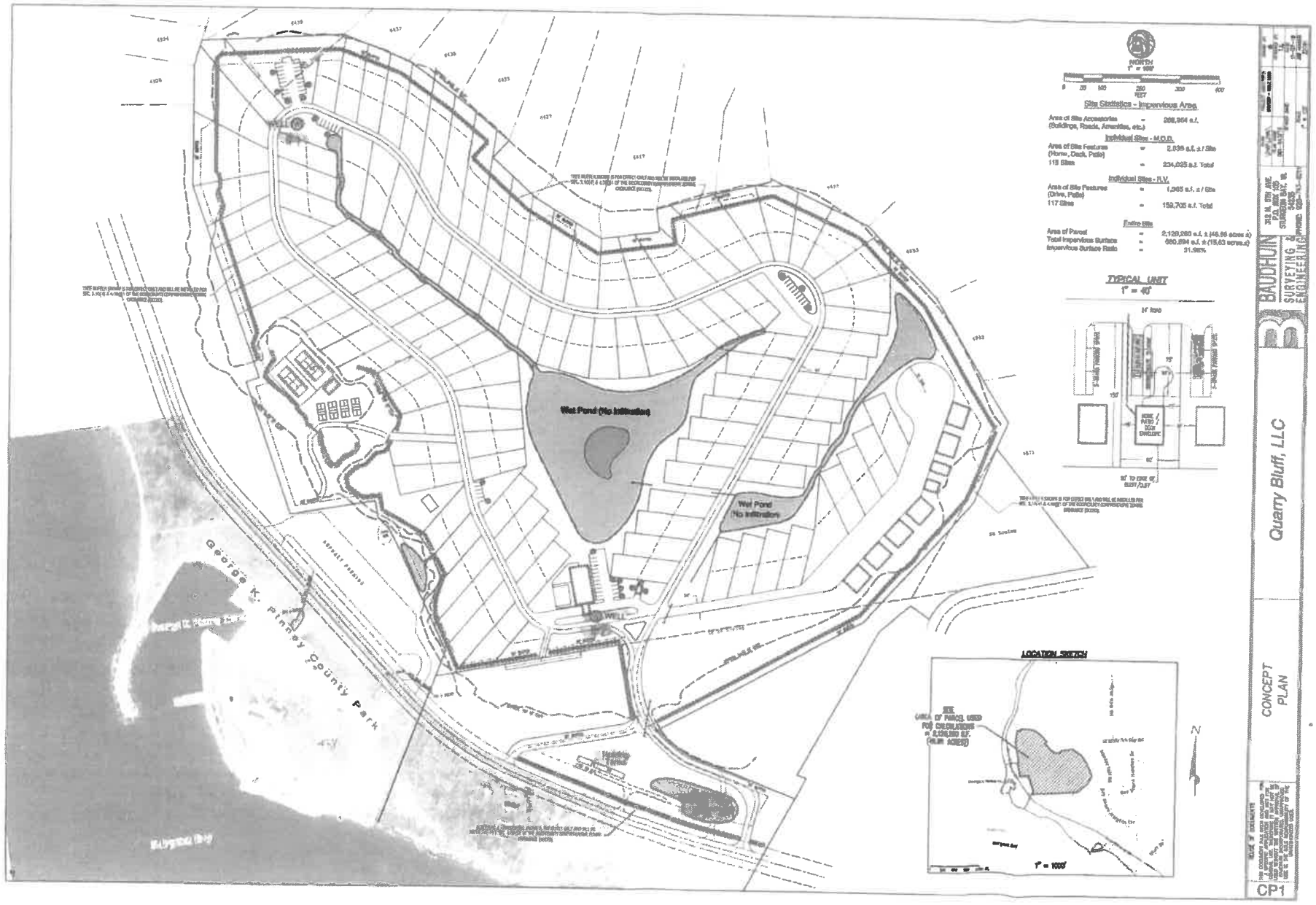
PART III: INTEREST IN WELLHEAD PROTECTION (WHP)

1. Does your community have a completed WHP plan? __ Yes - all wells __ Yes - one or more wells X No
2. Are you in the process of developing a WHP? __ Yes - all wells __ Yes - one or more wells X No
3. Would you like information about wellhead protection planning? __ Yes X No
4. Would you like assistance in developing a plan? __ Yes X No

INVENTORY CERTIFICATION

I certify that the answers provided in this inventory are, to best of my knowledge, truthful and accurate.

Printed Name of Respondent	Telephone Number	Date of completion
Steven J. Parent, P.E.	920-743-8211	11-7-16
Signature Steven J. Parent	**Title** Project Engineer	

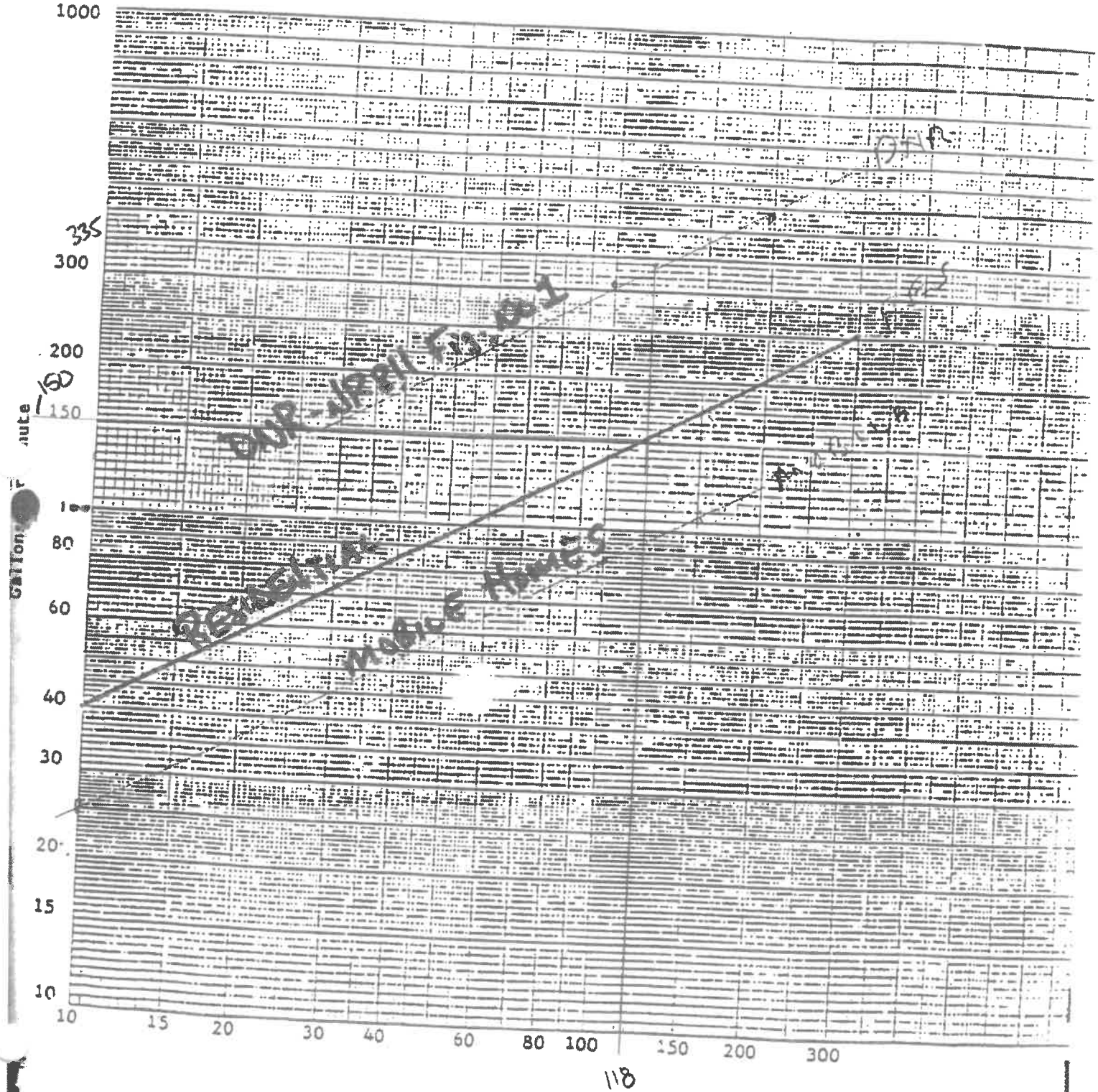

NORTH
1" = 100'
0 50 100 200 300 400
FEET
Site Statistics - Impervious Area
Area of Site Accessories (Buildings, Roads, Amenities, etc.) = 268,964 s.f.
Individual Sites - M.O.D.
Area of Site Features (Home, Deck, Patio) = 2,535 s.f. ± / Site
113 Sites = 234,023 s.f. Total
Individual Sites - R.V.
Area of Site Features (Drive, Patio) = 1,365 s.f. ± / Site
117 Sites = 159,705 s.f. Total
Entire Site
Area of Parcel = 2,129,283 s.f. ± (48.86 acres ±)
Total Impervious Surface = 660,594 s.f. ±(15.63 acres ±)
Impervious Surface Ratio = 31.02%
TYPICAL UNIT
1" = 40'
14' lane
HOME / PATIO / SIGN ENVELOPE
30' TO EDGE OF ASPHALT
Wet Pond (No Infiltration)
Wet Pond (No Infiltration)
George K. Pitney County Park
LOCATION SKETCH
XX
AREA OF PARCEL USED FOR CALCULATIONS = 2,129,283 S.F. (48.86 ACRES)
N
1" = 1000'
BAUDHUIN SURVEYING & ENGINEERING
Quarry Bluff, LLC
CONCEPT PLAN
CP1

REC'D June 16, 2000 From Norm Hahn - WDNR

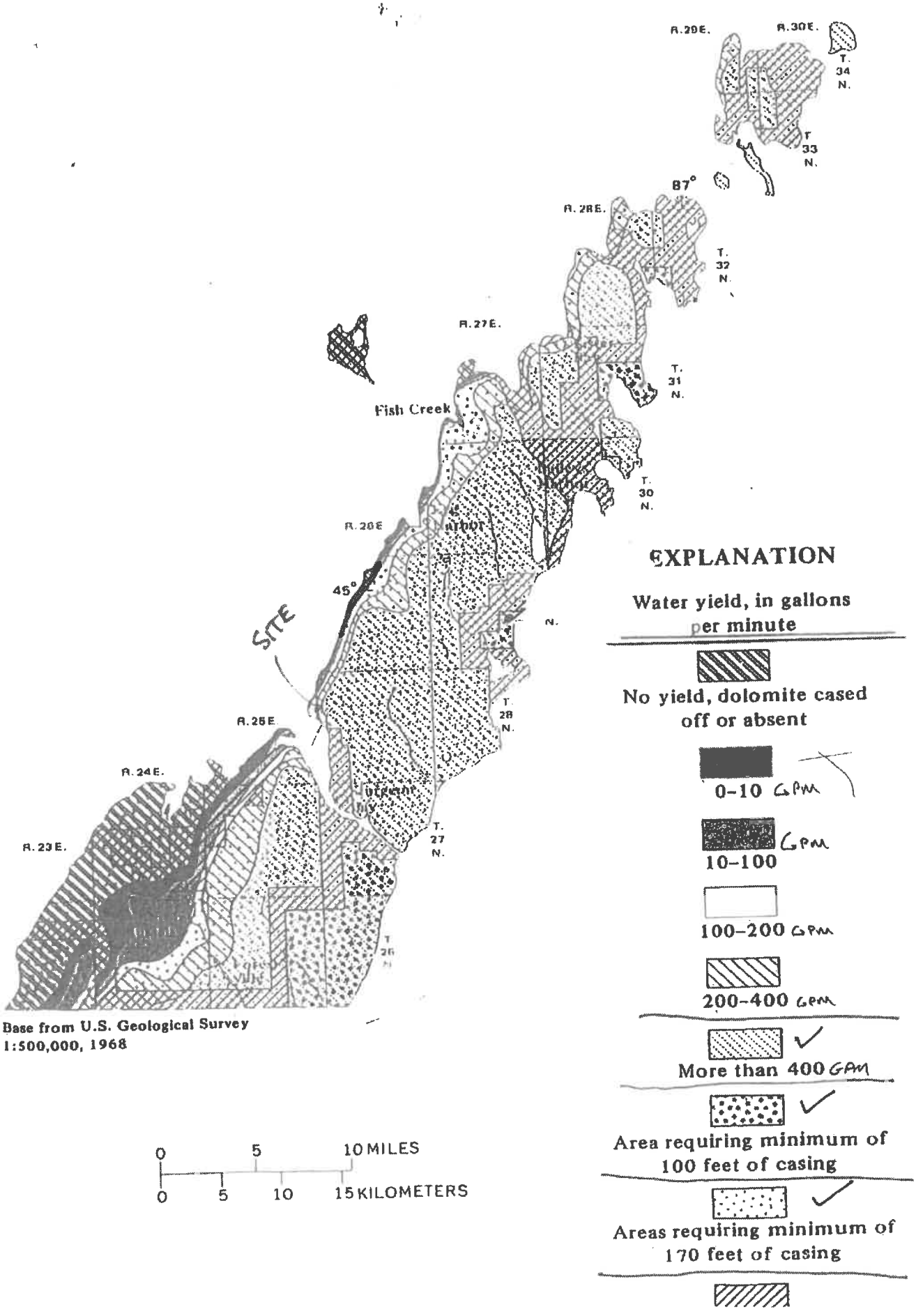
FIGURE 3-3

INSTANTANEOUS DEMAND FOR RESIDENTIAL COMMUNITY WATER SYSTEMS

(Number of Connections vs Gallons Per Minute)



Source: Standards and Criteria for Design and Construction of Public Water Supply Systems to Serve Residential Communities; Division of Health Services - Sanitary Eng. Section, State of North Carolina, 1974


R.29E.
R.30E.
T. 34 N.
T. 33 N.
87°
R.28E.
T. 32 N.
R.27E.
T. 31 N.
Fish Creek
T. 30 N.
R.26E
45°
SITE
N.
T. 28 N.
R.25E
R.24E.
R.23E.
T. 27 N.
T. 26 N.
Base from U.S. Geological Survey
1:500,000, 1968
0 5 10 MILES
0 5 10 15 KILOMETERS
EXPLANATION
Water yield, in gallons per minute
No yield, dolomite cased off or absent
0–10 GPM
10–100 GPM
100–200 GPM
200–400 GPM
More than 400 GPM
Area requiring minimum of 100 feet of casing
Areas requiring minimum of 170 feet of casing

Euclide Well Drilling Inc.

2496 Stone Rd
Sturgeon Bay WI 54235
Phone: 920-825-7575
Fax: 920-825-7547

Date: 11/26/2019

Pete Hurth
Baudhuin Surveying and Engineering
312 N. 5th Ave
Sturgeon Bay, WI 54235

Re: Well Capacity -- Quarry Bluff Project

Pete,
To follow-up on our conversation from several days ago, I went back through my records to review the amount of water generated from the wells we installed over the years in the area of the proposed project near Pinney Park. A vast majority of the wells generated over 100 gallons of water per minute, and I see no reason why the two proposed wells for the Quarry Project should not generate at a minimum of 100 gallons of water per minute. Also, as we discussed, knowing the depth that we would be drilling, and the aquifer that the new wells will be located in, there should not be any negative impact on the neighbor's wells.
Please let me know if you have any other questions.

Sincerely,

Mark Euclide

Wisconsin Well Driller License #5905

SECTION #6

Solid Waste Disposal

Item #6

Provisions for Solid Waste Disposal

Trash and recycling containers will be housed in a fully enclosed, dedicated building to eliminate animal intrusion and odors. The building will be approximately 16' x 30' with an overhead garage door. It will have the appearance of a nicely built, freestanding garage. Solid waste and recycling will be removed by a commercial hauler.

SECTION #7

Noise, Odor or Dust

Item #7

Whether the Proposed Use Creates Noise

Comments have been made that property owners living above the subject property can hear casual conversations from the adjacent boat launch when the wind is "just right." In talking with acoustical experts these comments are probably true. One of the main contributing factors is the amount of hard surfaces located from the boat launch to the easterly property owners. Exposed bedrock provides very little, if any, absorption of sound waves.

The proposed development will provide the following noise reduction elements:

- Extensive landscaping will be performed. Trees, hedges, shrubs, lawns and berms will be installed. Approx. 60 percent of the total surface area will consist of landscaped items. (See attached benefits of landscaping in noise reduction)
- "White noise" will be created by the construction of waterfalls and pond fountains.
- Building structures will absorb some noise, but importantly will reflect noise and keep sound waves within the development.
- Noise created along the east portion of the development will be reflected by the east quarry wall and be reflected westerly within the development. The quarry wall will act similar to a noise barrier located along freeways.

In addition to the above, rules and regulations will be in place to keep any noise to a minimum. Unreasonable noise will be addressed by onsite management at its source and discouraged. Nightly quiet hours will be enforced and firmly adhered to.

In addition, once a Motorcoach is in place on a property owner's site, it is seldom started or moved until the owner's visit is completed.

Furthermore, the demographic studies show a vast majority of ownership in the development will be in the 55 to 80 age group reflecting a more conservative lifestyle, similar to property owners in the immediate area.

Planting Noise Blockers: Best Plants For Noise Reduction In Landscapes

The most visually appealing way to block noise is with a dense growth of plants. Noise blocking plants are especially useful in urban areas where refracted noise from hard surfaces, such as buildings and pavement, are problematic. An advantage to using plants as noise blockers is that they absorb sounds best in the high frequencies that people find most annoying. Let's take a closer look at using noise reducing plants.

Planting Noise Blockers

You should plant noise reducing plants as you would a hedge [1]. Space them so that there won't be gaps between the plants when they reach maturity.

You can even install dense layers of plants to provide optimum noise protection. Begin with a row of shrubs nearest the noise, and plant a row of taller shrubs or trees behind them. Finish with a row of showy shrubs that face your home or garden. Choose the inside shrubs for their visual impact, fragrance, fall color and other desirable features. Consider how the appearance of the shrubs will complement your overall landscape design.

For best results, plant noise blocking plants on a berm [2]. Mound the soil as high as possible with a flat top at least 20 feet wide. The ideal height is 3 to 4 feet with sides that slope about 10 percent. A combination of a berm and a dense planting can reduce noise by as much as 6 to 15 decibels.

Shrubs and Trees as a Noise Barrier

Evergreen shrubs [3] make the best plants for noise because they provide year-round noise reduction. Broadleaf evergreens are more effective than narrow-leaf plants and conifers. Choose trees and shrubs with dense branches that reach all the way to the ground. Plants, such as hollies [4] and junipers [5], that have thick branches at ground level provide excellent noise reduction.

The Old Pump
House
Sherborne,
Dorset

HELLIS SOLUTIONS LIMITED *Practical management for the 21st century*

01935 814 110

Sound Barriers-The use of Trees and Shrubs to Reduce Noise

Introduction

Noise is defined as unwanted sound. Noise levels can be reduced by;

- reducing the noise at it's source
- increasing the distance between the source and the hearer
- erecting a solid barrier
- planting trees and shrubs

How is Sound Measured?

Sound pressure levels are used to measure the intensity of sound and are described in decibels. The decibel (dB) is a logarithmic unit which expresses the ratio of the sound pressure level being measured to a standard reference level.

A zero decibel level corresponds to the threshold of human hearing. An increase of 1 decibel is roughly equivalent to the smallest difference in loudness perceptible to the human ear and an increase of 10 decibels roughly corresponds to a doubling in the apparent loudness of a sound. Thus 20dB is twice as loud as 10 dB and 30dB is four times louder than 10dB, and so on.

Sound pressure levels of some common sounds. Threshold of Hearing 0 dB

Whisper	20 dB
Normal Speech	48 dB Busy Dual Carriageway 75 dB Dog Barking 92 dB
Passing Train	100 dB
Jet Aircraft	110dB

Reducing Noise

Solid barriers such as fences or mounds of earth are frequently used as sound barriers, but where space permits, trees and shrubs can be effective in reducing noise.

Alternatively trees and shrubs may be used in conjunction with solid barriers to achieve the best of all worlds.

Trees reduce perception of noise is by creating a visual barrier between the source and the hearer. It has been suggested that people are less conscious of noise if they cannot see the source.

Trees and shrubs produce a masking effect through the rustling of leaves, the movement of branches in the wind, the sounds of birds, insects and other animals.

Published results on the effectiveness of tree and shrub barriers vary from study to study, however, it is generally agreed that a belt of trees and shrubs will significantly reduce noise levels.

A dense belt of trees and shrubs should provide a reduction in noise of several decibels although reductions will be significantly less than a purpose built noise barrier of the same height and length.

How Can Trees Reduce Noise

The reduction of sound by vegetation is usually attributed to the processes of reflection, deflection and absorption.

Foliage appears to be the most efficient part of a tree for scattering sound and it seems that large leaves are more effective than small leaves.

Noise reduction tends to increase with tree height up to 10 -12m after which it tends to decrease. This is probably a result of lower branches dying and allowing sound to travel more easily.

There is a positive correlation between noise reduction and the width of the belt of trees; the wider the belt the greater the reduction.

Item #7

Whether the Proposed Use Creates Odor

In reviewing complainants from the public, it appears there are two major concerns in regard to odor.

Campfire odor – All unit owners, if they decide to build an outdoor firepit, will be required to be burn natural gas. No wood burning campfires will be allowed by owners. The only outdoor wood burning firepit will be located on the western portion of the development on common ground with the use being limited.

The other issue of concern regarding odor that will be controlled will be the holding tank pumping station. The holding tank pump out will be near the main entrance. The nearest home is approx. 470 ft. away from the development holding tank. Obviously, regarding distance setbacks, the placement of the holding tank is more than code compliant. However, we still feel it is important to control any possible odor during the pumping process. Controlling odor will be performed by implementing the following:

- A heavy-duty submersible pump will be installed in the holding tank. This pump will act as an auxiliary "push" pump. When used in combination with the impeller pump on the semi-tanker, the time spent loading the truck will be substantially reduced.

- The pumper trucks servicing the holding tank will have a vapor recovery system whereby each cubic foot of septic pumped into the truck displaces a cubic foot of air. The displaced air is piped directly back into the holding tank resulting in a balanced pressure environment in both the holding tank and the truck tank. This will drastically reduce the odor that escapes during the pumping process.

- If there is still an issue with odor, a carbon filter and/or misting air freshener systems could be installed. (See attached.)

Gmail

Mike Parent <hksportsfields@gmail.com>

Walex Products Company Inc...

Brian Bost <brian@walex.com> Fri, Aug 30, 2019 at 12:45 PM
To: "mike@hksportsfields.com" <mike@hksportsfields.com>

Mike,

I am so sorry for the delay in getting this email out to you but as promised here is a little more info on the options for your application. Each link describes the possible solutions for your odor control issues. As we discussed on the phone I believe the combination of a liquid deodorizer in the vault itself would help, the odor elimination spray for any airborne odors and the vaccu-fresh tank and deodorizer for your truck. Any single one of these should improve the current conditions and a combination of any two or all three will virtually eliminate any foul odors.

1. Misting System - https://www.walex.com/product/odor-neutralizing-misting-system-high-pressure-outdoor-misting-kit/

2. Chemical Liquid for Vault Toilets - https://www.walex.com/product/exodor-pt-50-supreme/

3. Odor Elimination Spray to reduce odor - https://www.walex.com/product/exodor-assure-odor-neutralizer-spray/

4. Bio-Active Waste Digester and Fragrance Enhancer Product - https://www.walex.com/product/bio-active-holding-tank-treatment-2/

5. Vaccu-Fresh Tank and Liquid for Pump Trucks - https://www.walex.com/product/vacu-fresh-pump-exhaust-

deodorizing-system/

Please let me know you received and if any questions please feel free to call or email me back and we can discuss.

PS – I have attached a catalog for you to print with the descriptions and pricing as well. I hope this helps.

THANK YOU AGAIN SO MUCH!!

Brian A. Bost

Regional Account Manager

WALEX Products Company, Inc.

Office. 800-338-3155

Fax. 910-371-2094

Cell. 910-200-1740

www.walex.com

Find us on Facebook

Walex-Commercial-Catalog-2018.pdf
26332K

Item #7

Whether the Proposed Use Creates Dust

Once the major construction is completed there will be minimal, if any, dust generated. All roads and parking lots will be paved with asphalt. All driveways and patio areas will be constructed of concrete or brick pavers. All other surface areas will be lawns or landscaped areas comprised of trees, shrubs, or other vegetation. Planting beds will be mulched with wood chips or stone mulch.

Dust during construction is discussed under "Other topics to consider" after item #17 CUP Addendum.

SECTION #8

Safe Access

Item #8

Provisions of Safe Vehicular and Pedestrian Access

Vehicular Access

Two Existing Driveways to Cty Hwy B

One New Driveway to Cty Hwy B

There will be a total of three driveways that service the development. There are presently two existing driveways that will remain. (See attached drawing) It should be noted that the southernmost existing driveway will be relocated approx. 100ft to the south of its present location.

For presentation and discussion purposes please note:

- "Driveway #1" is the northernmost existing driveway. This driveway, from a vehicular standpoint, will only be used for emergency access. Removable safety bollards will be installed that will prohibit any day to day vehicular activity.
- "Driveway #2 will be a newly-constructed driveway that will be used exclusively for pumping and hauling septic waste.
- Driveway #3 will be the main entrance for ingress and egress to and from the development.

The emphasis of Item #8 of the CUP is to examine the safety aspect of the driveway entrances. but want to reiterate that all constructed driveways will meet or exceed industry standards from a design and construction standpoint. We have included a conceptual drawing depicting a single, two-way entrance with right turn lane taper at the main entrance (Driveway #3). Although not required, a north bound (right side of Cty Hwy B) deacceleration lane was suggested by the County Highway Commissioner as well as the traffic impact study, which we would agree to install.

An in-depth engineering study was performed to analyze the location of the three driveways and determine if there are any safety concerns for not only vehicles accessing the development, but the general driving public traveling on Cty Hwy B. The main emphasis of the study was to determine if there is adequate visibility and therefore reaction time to not endanger vehicular traffic near the driveway entrances. (Please see attached report) In summary, all driveway entrances have more than adequate visibility from both directions. In fact, the report reveals that vehicular safety is not severally compromised at speeds nearly double the posted speed limit of 35 mph.

A second relevant discussion point is the slopes of the driveways, mainly driveways #1 and #3. Driveway #1 (emergency entrance) will be constructed at approx. 8%. Driveway #3 (the main entrance) will be constructed where the first 50 feet off of Cty Hwy B will be at 1% slope. The balance of the driveway, approx. 670ft, will be constructed at an average of 5.5% slope. In comparison, and to provide a point of reference, Dunn Road, a short distance south is constructed at 11% slope. In other words, Dunn Road is approx. twice as steep as the main entrance of the development.

November 21, 2019

Subject: Quarry Bluff
Entrance Design
Town of Sevastopol, Door County, Wisconsin

The Quarry Bluff class-A motor coach resort development is accessible by three driveways from County Highway B. Traffic safety was analyzed at these driveways for vehicles traveling on County Highway B, vehicles exiting driveways, and pedestrians by using stopping sight distance (SSD) design procedures.

SSD is the length of road needed for a vehicle traveling on County Highway B to safely stop before reaching a visible, stationary object in its path. This analysis determines the minimum and maximum SSD for vehicles traveling on County Highway B in relation to each of the driveways for this development. Worst case design values were used assuming slower reaction times and wet pavement road conditions.

Drive1 is one of the existing driveways which will become a pedestrian access path and a point of entry for emergency vehicles only, if needed. Drive 2 is a proposed entrance for septic trucks only to access the holding tank for pumping and maintenance. Drive 3 is the main entrance for this project site and therefore the most critical for traffic safety.

Minimum SSD at these driveways is 257-feet per Table 3-2 of AASHTO *Green Book*, enclosed. This minimum distance is worst case, using 35 mph posted speed limit with a 3% downgrade road slope. Actual road conditions at these driveways have both downgrade and upgrade road slopes less than 1%.

Enclosed plans show the minimum SSD and corresponding sight lines for a vehicle traveling on County Highway B and a vehicle exiting any of the driveways to see each other. These sight lines assume the driver exiting the driveway is approximately 8-feet from edge of pavement of County Highway B. Also included for each driveway is the maximum SSD available based on driver sight lines being free and clear of obstructions within the road right-of-way. Table 1 presents maximum speed limits corresponding to maximum SSD available at each driveway.

Table 1: Maximum SSD

	Traveling South			Traveling North		
Driveway	Max. SSD (ft)	Grade	Max. Design Speed (mph)*	Max. SSD (ft)	Grade	Max. Design Speed (mph)*
1	372	+0.4%	45	822	-0.6%	65
2	520	+0.6%	55	>800	-0.6%	65
3	728	+0.6%	65	>800	-0.6%	65

*Per Table 3-2 of AASHTO *Green Book* assuming 3% minimum grades and maximum speed of 65 mph

Maximum available SSD for all three driveways exceeds the minimum design SSD. Even if vehicles are traveling faster than the posted speed limit of 35 mph on County Highway B, the maximum SSD available is still adequate to allow for safe travel. Those traveling on County Highway B have adequate distance to stop safely and those exiting any of the driveways for this development have a clear line of site to see all oncoming vehicles and pedestrian traffic. Based on this information, the proposed driveway locations are adequate to maintain safe traffic for vehicles traveling on County Highway B, vehicles exiting these driveways, and pedestrians.

Table 3-2. Stopping Sight Distance on Grades

U.S. Customary						
Design Speed (mph)	Stopping Sight Distance (ft)					
	Downgrades			Upgrades		
	3%	6%	9%	3%	6%	9%
15	80	82	85	75	74	73
20	116	120	126	109	107	104
25	158	165	173	147	143	140
30	205	215	227	200	184	179
35	257	271	287	237	229	222
40	315	333	354	289	278	269
45	378	400	427	344	331	320
50	446	474	507	405	388	375
55	520	553	593	469	450	433
60	598	638	686	538	515	495
65	682	728	785	612	584	561
70	771	825	891	690	658	631
75	866	927	1003	772	736	704
80	965	1035	1121	859	817	782
85	1070	1149	1246	949	902	862

Metric						
Design Speed (km/h)	Stopping Sight Distance (m)					
	Downgrades			Upgrades		
	3%	6%	9%	3%	6%	9%
20	20	20	20	19	18	18
30	32	35	35	31	30	29
40	50	50	53	45	44	43
50	66	70	74	61	59	58
60	87	92	97	80	77	75
70	110	116	124	100	97	93
80	136	144	154	123	118	114
90	164	174	187	148	141	136
100	194	207	223	174	167	160
110	227	243	262	203	194	186
120	263	281	304	234	223	214
130	302	323	350	267	254	243
140	341	367	398	302	287	274

On nearly all roads and streets, the grade is traversed by traffic in both directions of travel, but the sight distance at any point on the highway generally is different in each direction, particularly on straight roads in rolling terrain. As a general rule, the sight distance available on downgrades is larger than on upgrades, more or less automatically providing the appropriate corrections for grade. This may explain why some designers do not adjust stopping sight distance because of grade. Exceptions are one-way roadways or streets, as on divided highways with independent profiles. For these separate roadways, adjustments for grade may be needed.

3.2.2.5 Variation for Trucks

The recommended stopping sight distances are based on passenger car operation and do not explicitly consider design for truck operation. Trucks as a whole, especially the larger and heavier units, need longer stopping distances for a given speed than passenger vehicles. However, there is one factor that tends to balance the additional braking lengths for trucks with those for passenger cars. The truck driver is able to see substantially farther beyond vertical sight obstructions because of the higher position of the seat in the vehicle. Separate stopping sight distances for trucks and passenger cars, therefore, are not generally used in highway design.

There is one situation in which the goal should be to provide stopping sight distances greater than the design values in Table 3-1. Where horizontal sight restrictions occur on downgrades, particularly at the ends of long downgrades where truck speeds closely approach or exceed those of passenger cars, the greater height of eye of the truck driver is of little value. Although the

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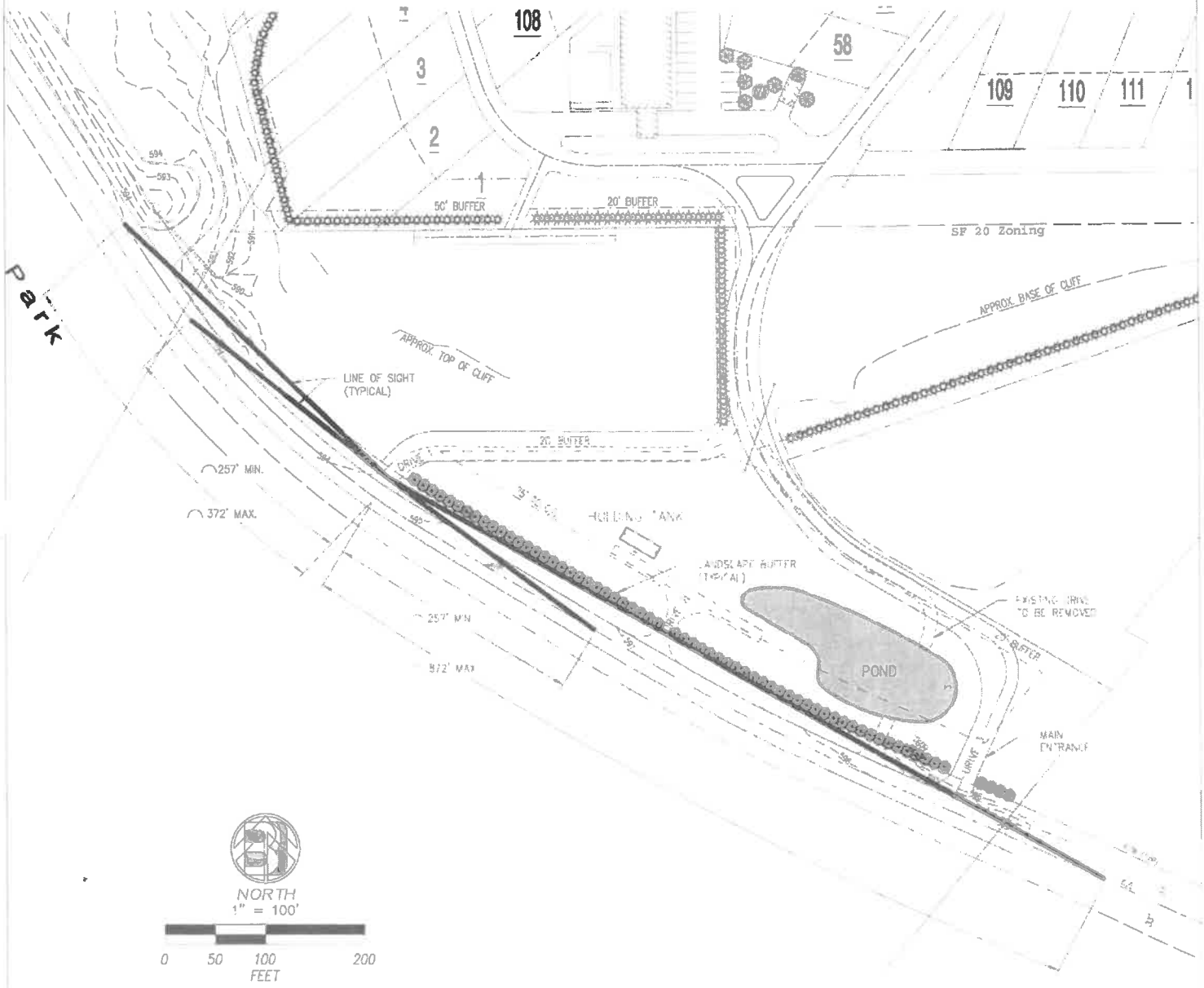


NOTE:

- STOPPING SITE DISTANCE (SSD) DIMENSIONS SHOWN FOR BAY SHORE DRIVE TRAFFIC FOR EACH QUARRY BLUFF DEVELOPMENT ENTRANCE
- SIGHT LINES FROM DRIVEWAY ASSUME DRIVER TO BE 8' FROM EDGE OF PAVEMENT.

JOB # 22061
1 of 3

Traffic Safety Drive 1

Quarry Bluff

BAUDHUIN SURVEYING & ENGINEERING

PART OF DRAWING: Y:\dbb\LDWG\Drautzer-Goelz 22061\dwg\C61-TRAFFIC

P.O. BOX 105
312 N. 5TH AVENUE
STURGEON BAY, WI 54235
PHONE: (920)743-8211

DATE 11-21-19
DESIGNED BY: R.M.B.
REVIEWED BY: P.J.H

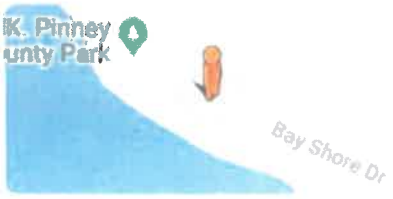
Google Maps

Image capture: Sep 2013 © 2019 Google

Sturgeon Bay, Wisconsin

Google

Street View - Sep 2013



DRIVE 1
TRAVELING NORTH

Google Maps

Image capture: Sep 2013 © 2019 Google

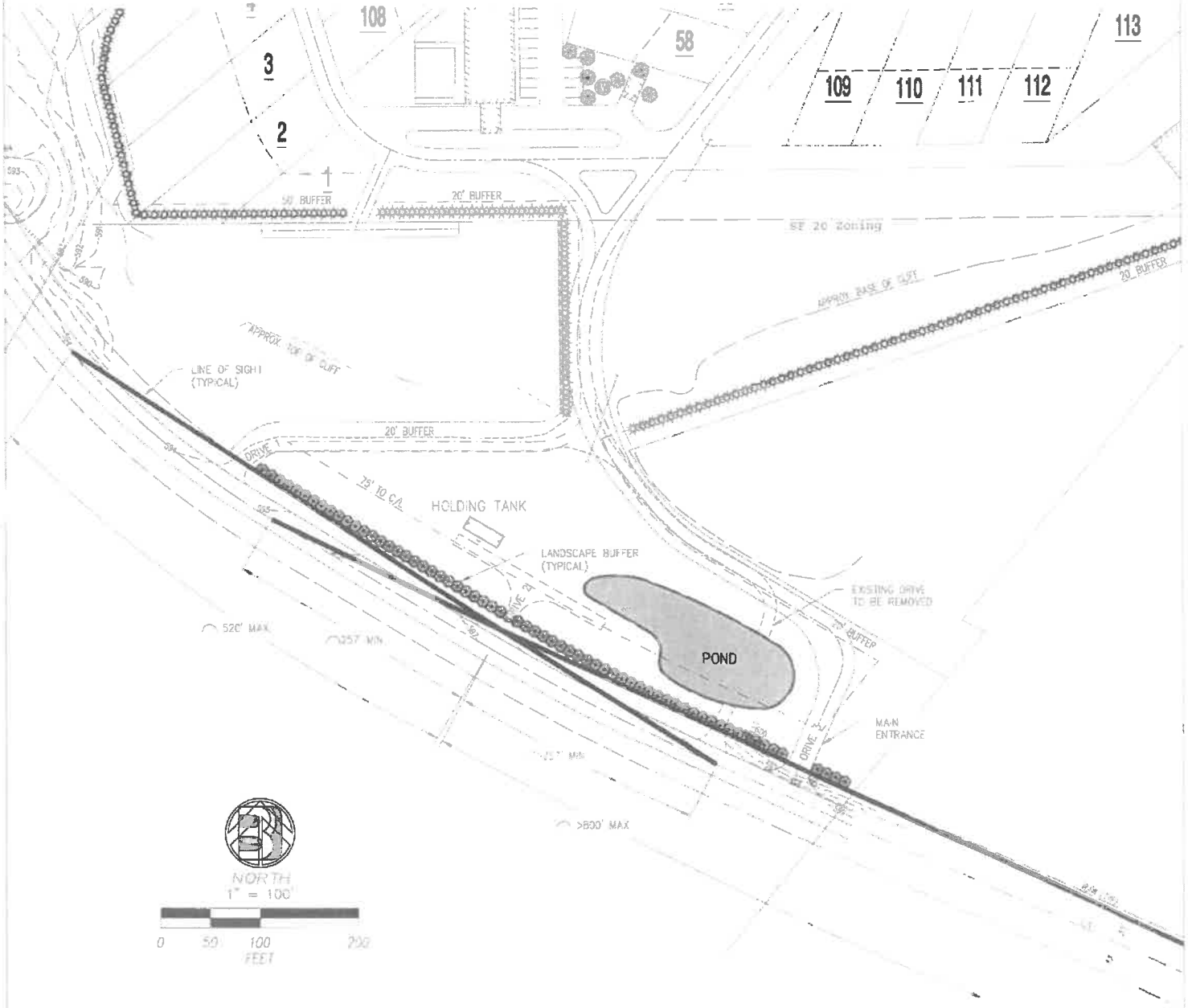
Sturgeon Bay, Wisconsin

Google

Street View - Sep 2013

DRIVE 1
TRAVELING SOUTH

3 OF 3



NOTE:
- STOPPING SITE DISTANCE (SSD) DIMENSIONS SHOWN FOR BAY SHORE DRIVE TRAFFIC FOR EACH QUARRY BLUFF DEVELOPMENT ENTRANCE.
- SIGHT LINES FROM DRIVEWAY ASSUME DRIVER TO BE 8' FROM EDGE OF PAVEMENT.

JOB # 22061 1 of 3	**Traffic Safety Drive 2**	**Quarry Bluff**	BAUDHUIN SURVEYING & ENGINEERING	PATH OF DRAWING: Y:\dvb\LDWG\Dreutzer-Goetz 22061\dwg\061-TRAFFIC P.O. BOX 105 312 N. 5TH AVENUE STURGEON BAY, WI. 54235 PHONE: (920)743-8211
				DATE: 11-21-19 DESIGNED BY: R.M.B. REVIEWED BY: P.J.H

Google Maps 4865 Co Rd B

Image capture: Sep 2013 © 2019 Google

Sturgeon Bay, Wisconsin

Google

Street View - Sep 2013

DRIVE 2
TRAVELING NORTH

2 of 3

Google Maps 4865 Co Rd B

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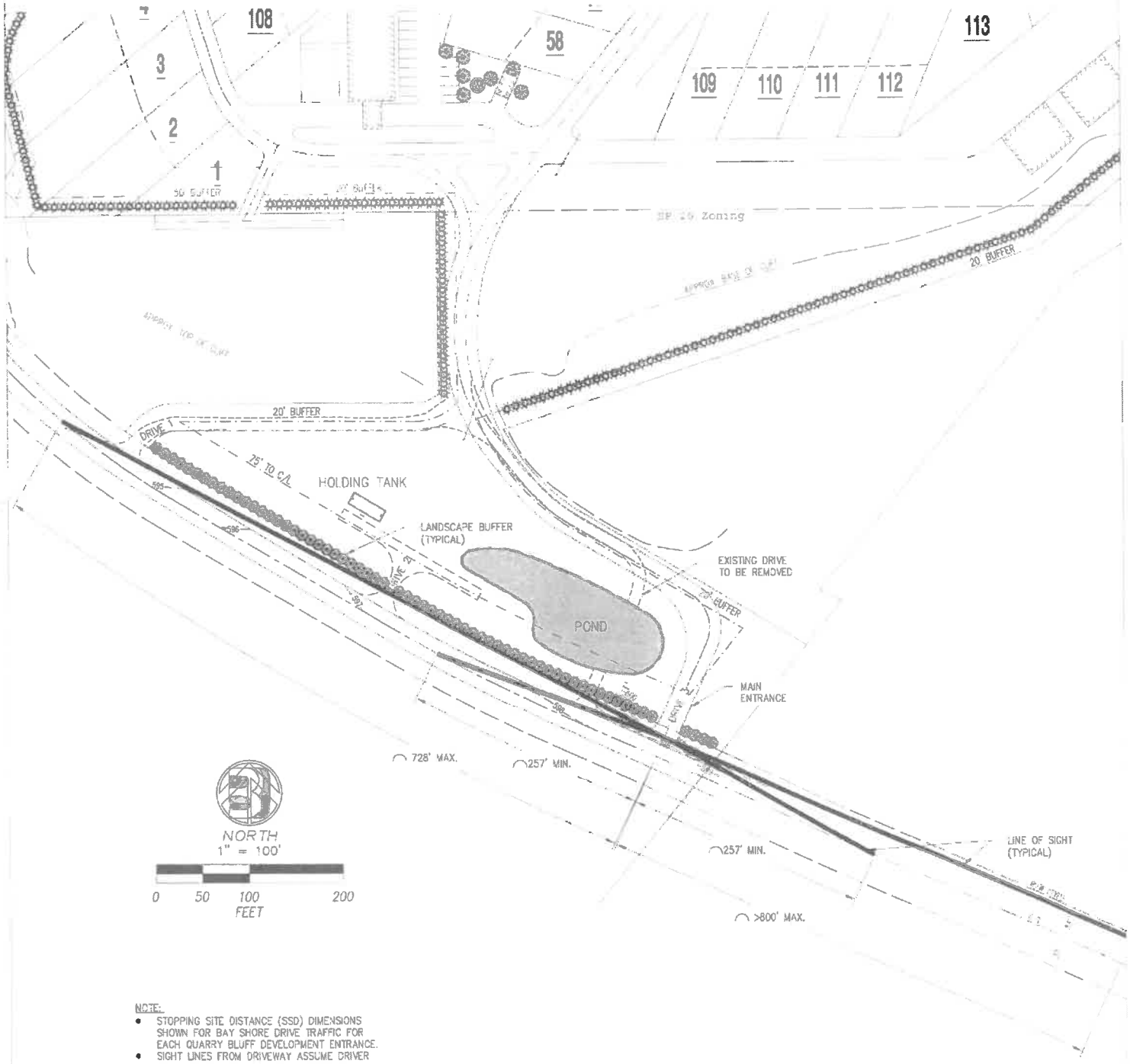
Sturgeon Bay, Wisconsin

Google

Street View - Sep 2013

DRIVE 2
TRAVELING SOUTH

3 OF 3



NOTE:
- STOPPING SITE DISTANCE (SSD) DIMENSIONS SHOWN FOR BAY SHORE DRIVE TRAFFIC FOR EACH QUARRY BLUFF DEVELOPMENT ENTRANCE.
- SIGHT LINES FROM DRIVEWAY ASSUME DRIVER TO BE 8' FROM EDGE OF PAVEMENT.

JOB # 2206
1 of 3

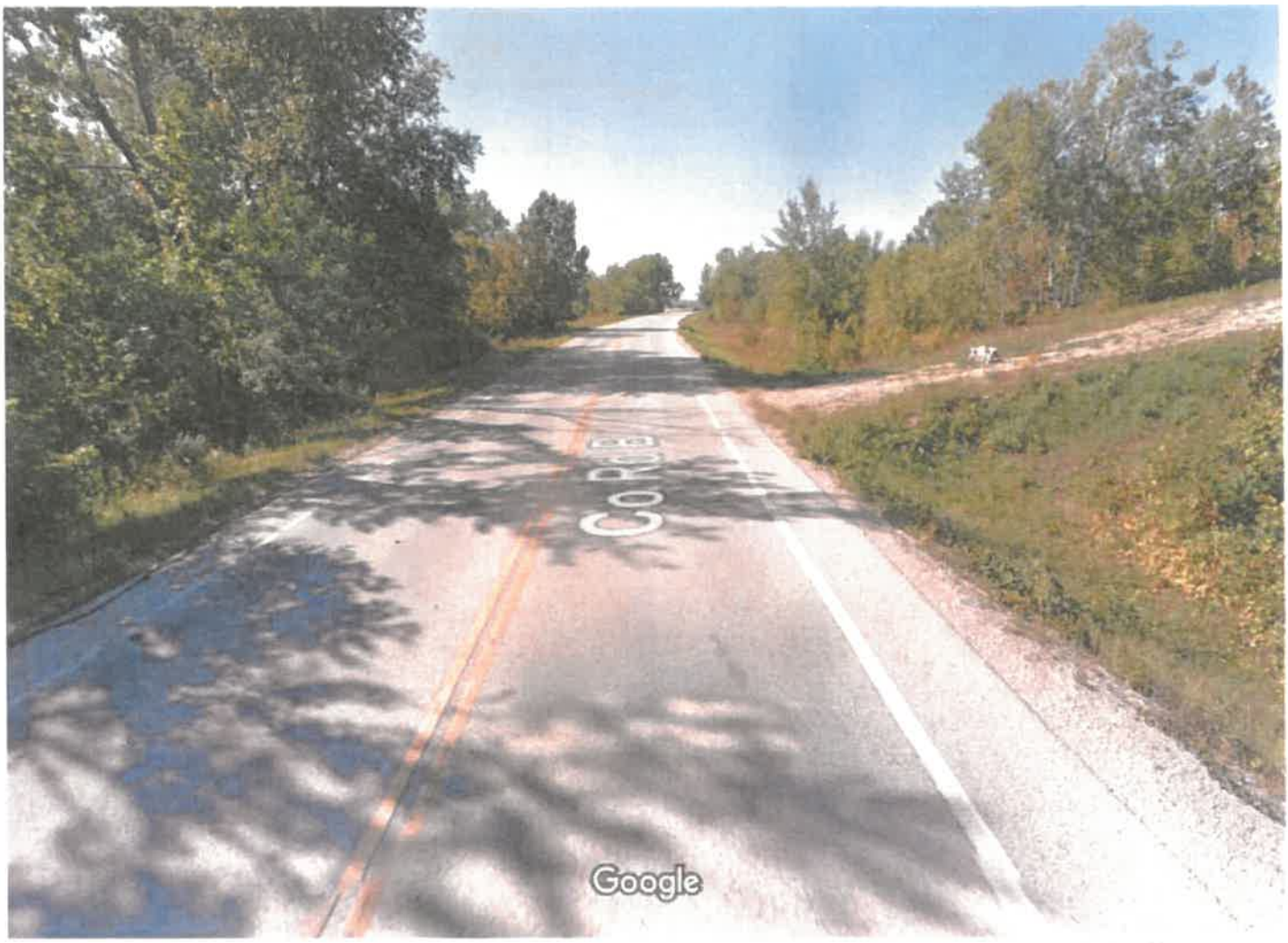
Traffic Safety
Drive 3

Quarry
Bluff

BAUDHUIN
SURVEYING & ENGINEERING
P.O. BOX 105
312 N. 5TH AVENUE
STURGEON BAY, WI. 54235
PHONE: (920)743-8211

PATH OF DRAWING: Y:\cvb\LDWG\Draulzer-Goetz 22061\dwg\061-TRAFFIC
DATE: 11-21-19
DESIGNED BY: R.M.B.
REVIEWED BY: P.J.H

Google Maps



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DRIVE 3
TRAVELING NORTH

2 of 3

Google Maps

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Google

Street View - Sep 2013

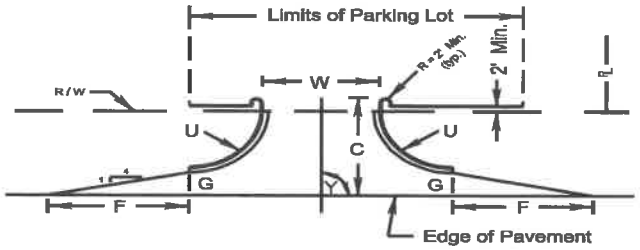
DRIVE 3
TRAVELING SOUTH

3 OF 3

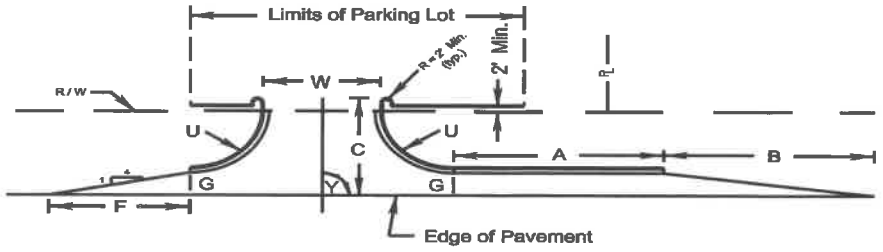
Commercial Entrance Designs along Highways with Shoulders

COMMERCIAL ENTRANCE DESIGNS ALONG HIGHWAYS WITH SHOULDERS

SINGLE TWO - WAY ENTRANCE



SINGLE TWO - WAY ENTRANCE WITH RIGHT TURN LANE AND TAPER



LETTER SYMBOL	DIMENSIONS
A	As determined by the Engineer
B	100' or greater
C	See Entrance Throat Table 4-2 and Corner Clearance Figure 4-3.
F	48' or greater
G	12'
U *	25' - 50' radii, Curb and Gutter or Curbing. The selected shall accommodate the anticipated type of vehicle usage. Larger radii should be considered by the designer or may be required by the Engineer if larger vehicles are anticipated; however, in no case shall radius be less than 25'.
W *	30' - 40'
Y *	90° Prefered 60° Minimum

* For Subdivision Streets and Alleys, radii, width and angle should be in accordance with Subdivision Street Design Guide in the Road Design Manual, Appendix B.

Notes:

Entrance details shown on this sheet may be modified to meet specific site requirements as directed or approved by the Engineer at the Residency or District, when based on sound engineering principles.

If an Accessible route as defined in Section 15.2-2021 in the Code of Va. is present, curb ramps in accordance with Std. CG-12 will be provided.

Curb and Gutter or Curbing may be deleted on low intensity uses if approved by Residency or District Administrator.

FIGURE 4- 9 COMMERCIAL ENTRANCE DESIGNS ALONG HIGHWAYS WITH SHOULDERS

Note: All entrance design and construction shall accommodate pedestrian and bicycle users of the highway in accordance with the Commonwealth Transportation Board's "Policy for Integrating Bicycle and Pedestrian Accommodations".

Item #8

Provisions of Safe Pedestrian Access

There will be minimal, if any, access to the development by foot traffic. At this point in time we do not anticipate constructing any type of sidewalks. Owners or guests that exit the development by foot would either exit via driveway #1 or driveway #3 and then be obliged to follow any rules of walking along side Cty Hwy B.

SECTION #9

Traffic Flow

Item #9

Whether the Proposed Project Adversely Impacts Neighborhood Traffic Flow or Congestion.

There have been numerous concerns voiced regarding the impact of the proposed development adversely affecting traffic flow and congestion on Cty Hwy B. An in-depth traffic impact study was performed (see attached) and the findings reveal that the overall impact on Cty Hwy B is minimal. In addition to the findings of the traffic impact report, the following augments our position that traffic will be minimally affected by the development.

- Cty Hwy B is a county road, designated as a "Major Rural Collector Road" and is defined per WDOT as a route that generally serves places with populations greater than 1,000 and provides services to small to moderated-sized places, and other intra-area traffic generators, and link those generators to nearby larger populations, i.e. cities, or higher function routes. Major collector roads are to serve the more important intracounty travel corridors.
- Cty Hwy B is actually paved wider than standard rural collector roads. Cty Hwy B is paved with drive lanes of eleven ft with paved shoulders of three ft. Total asphalt of 28ft is two ft wider than standard width. Gravel shoulders are between one to two ft wide or wider depending on location.
- There are other existing contributing factors that are adversely affecting both traffic and pedestrian traffic safety on Cty Hwy B.
    - Due to the fact that numerous existing driveways on Cty Hwy B are substandard and do not meet minimum driveway widths, contractors and other service providers are required to park trucks and/or trailers directly in drive lanes. (Please see attached) While an in-depth study was not performed it appears that this is almost a daily occurrence.

    - While performing our due diligence on Cty Hwy B, it certainly appears that speeding is a common occurrence. Again, an in-depth study was not performed, but with the longer sightlines in certain areas and speed limits of 35 mph, traffic backed up on several occurrences when the speed limit was followed.

- We realize that the above two items are mutually exclusive from the proposed development, but want to make the point that there are current safety issues that are contributing factors that should be independently addressed and not lumped into the concerns that the development will generate.

Robert E. Lee & Associates, Inc.
Engineering • Surveying • Environmental Services
1250 Centennial Centre Boulevard • Hobart, WI 54155 • 920-662-9641 • www.releeinc.com

October 24, 2019

Mr. Tom Goelz, Principal
NORDIN PROJECT MANAGEMENT
P.O. Box 54
Fish Creek, WI 54212

RE: Traffic Projections – Quarry Bluff, Door County, WI

Dear Mr. Goelz:

Robert E. Lee & Associates, Inc. (REL) was retained to determine the potential traffic impact that the proposed development at Quarry Bluff would have on CTH B (Bay Shore Drive), located in Door County, just north of Sturgeon Bay.

The Wisconsin Department of Transportation (WisDOT) periodically takes traffic counts on most state and county highways and projects; these count into the normal traffic that can be expected to use the highway on any given day. This normal traffic count is called the Annual Average Daily Traffic (AADT).

The closest location to the Quarry Bluff Development, where WisDOT has taken a AADT count, is on CTH B (Bay Shore Drive) on the north side of the City of Sturgeon Bay, about 3 miles south of Quarry Bluff. The most current traffic information that WisDOT has at this location, is 1,700 vehicles per day (vpd) in 2015. Previous to that, WisDOT's AADT at this location in 2009 was 1,400 vpd. (This information was obtained from WisDOT's interactive traffic website). This represents an average increase of about 3.3 percent per year. If the traffic growth continues at that same rate, an AADT of about 2,350 vpd can be expected in 2025. However, to be conservative, if it is assumed that the traffic growth will be half of the recent growth, say 1.65 percent. This is within the normal growth range for a rural county highway, and will ensure that the projected volumes are not over-inflated. Therefore, the projected traffic volume on CTH B in 2025 would be 2,000 vpd.

WisDOT would typically consider the capacity of a two-lane rural roadway to be about 12,000 to 15,000 vpd. When a roadway reaches these volumes, they would normally consider adding lanes to the facility. For reference, STH 42, north of Sturgeon Bay, north of STH 57, had an AADT of 7,200 vpd in 2018. STH 57 north of Sturgeon Bay, north of STH 42 had an AADT of 5,600 vpd in 2018. The combined area of STH 42 and STH 57, north of Sturgeon Bay, but south of where they split, had an AADT of 12,200 vpd in 2018.

The Institute of Transportation Engineers (ITE) publishes common trip generation rates for developments as a guide to determine the amount of trips (or traffic in and out of a proposed development) that can be expected for various types of developments. According to ITE's *Trip Generation Manual, 10th Edition*, a development of Recreational Homes (similar to the Quarry Bluff development), can expect to generate 0.28 trips per unit in the PM peak hour when fully developed. At full development (which is expected to be in 5 to 7 years, so for this discussion, it is assumed to be 2025), Quarry Bluff is expected to have 117 units. Therefore, it can be expected that Quarry Bluff will generate about 33 trips during the PM peak hour (0.28 x 117 = 33).

To determine the impact of what 33 trips during the PM peak hour will have on the existing traffic capacity of CTH B, the peak hour trips need to be converted to a daily total to compare to the daily traffic amount from WisDOT. To be conservative, the peak hour volume will be considered to be the same as the design hour volume (DVH). The design hour volume on a roadway is generally considered the 30th highest hour volume on the road during the year. Typically, DHV is about 8 to 12 percent of the daily traffic. Therefore, if there are 33 trips generated during the peak hour and the peak hour comprises about 10 percent of the daily traffic, Quarry Bluff could be expected to add about 330 vehicles per day to the traffic on CTH B.

As an alternative check to the number of projected generated trips stated above, the number of trips can also be estimated, based on the size of the development in acres (verses the number of units). In ITE's *Trip Generation Manual, 6th Edition,* a regression equation was developed to determine number of trips generated based on the size (in acres) of the Recreational Home development (Number of Trips = 0.261 x Number of Acres + 14.874). Based on Quarry Bluff's size of 57 acres, it is estimated that 30 trips would be generated during the PM peak hour. This matches closely to the 33 trips calculated above.

ITE's *6th Edition* also demonstrates that the number of trips generated on Saturdays and Sundays are about the same as those generated during weekdays.

For comparison, a similar development in Michigan recorded a traffic count in and out of their facility. With 135 units occupied, their peak day traffic was 213 vpd. Therefore, the projected 330 trips per day for Quarry Bluff seems conservative.

Of all the vehicles entering and leaving (number of trips) Quarry Bluff, it is estimated that about 70 percent would travel to/from the south on CTH B and about 30 percent would travel to/from the north on CTH B. This estimate is based on the large urban area around Sturgeon Bay, which is located south of the project. In addition, most of the resident's permanent homes are probably located south of the development. Therefore, the biggest impact would be to CTH B south of Quarry Bluff. Seventy percent of the 330 daily trips would be 231 vehicles per day added to CTH B south of the development. The 231 vehicles per day is less than 12 percent of the 2,000 vehicles per day that are projected to travel on CTH B in 2025. Given that CTH B is currently well under capacity, a 12 percent increase on traffic on CTH B would be considered a minimal increase in traffic.

The proposed location for the entrance to Quarry Bluff is located on a fairly straight and level section of CTH B; therefore sight distance for vehicles turning in and out of the development should not be a problem. We would recommend, however, that any trees or brush at the entrance that may block vision would be removed. In addition, we would recommend paving a right turn taper on the existing shoulder for northbound vehicles turning into the development.

If you have any questions or desire more information, please let me know.

Sincerely,

ROBERT E. LEE & ASSOCIATES, INC.

Mark S. Schuster, P.E.
Transportation Engineering Manager

MSS/LAR

Functional Classification Systems for Rural Areas

Rural roads consist of those facilities that are outside of small urban and urbanized areas, as previously defined. They are classified into four major systems: Principal arterials, minor arterial roads, major and minor collector roads, and local roads.

Rural principal arterial system

The rural principal arterial system consists of a connected rural network of continuous routes having the following characteristics:

- Serve corridor movements having trip length and travel density characteristics indicative of substantial statewide or interstate travel.
- Serve all, or virtually all, urban areas of 50,000 and over population and a large majority of those with population of 25,000 and over.
- Provide an integrated network without stub connections except where unusual geographic or traffic flow conditions dictate otherwise (e.g., international boundary connections and connections to coastal cities).

In the more densely populated States, this system of highway may not include all heavily traveled routes which are multi-lane facilities. It is likely, however, that in the majority of States the principal arterial system will include all existing rural freeways.

The principal arterial system is stratified into the following two subsystems:

- Interstate System.--The Interstate System consists of all presently designated routes of the Interstate System.
- Other principal arterials.--This system consists of all nonInterstate principal arterials.

Rural minor arterial road system

The rural minor arterial road system should, in conjunction with the principal arterial system, form a rural network having the following characteristics:

- Link cities and larger towns3 (and other traffic generators, such as major resort areas, that are capable of attracting travel over similarly long distances) and form an integrated network providing interstate and intercounty service.
- Be spaced at such intervals, consistent with population density, so that all developed areas of the State are within a reasonable distance of an arterial highway.
- Provide (because of the two characteristics defined immediately above) service to corridors with trip lengths and travel density greater than those predominantly served by rural collector or local systems. Minor arterials therefore constitute routes whose design should be expected to provide for relatively high overall travel speeds, with minimum interference to-through movement.

Rural collector road system

The rural collector routes generally serve travel of primarily intracounty rather than statewide importance and constitute those routes on which (regardless of traffic volume) predominant travel distances are shorter than on arterial routes. Consequently, more moderate speeds may be typical, on the average.

In order to define more clearly the characteristics of rural collectors, this system should be subclassified according to the following criteria:

Major collector roads.--These routes should: (1) Provide service to any county seat not on an arterial route, to the larger towns not directly served by the higher systems, and to other traffic generators of equivalent intracounty importance, such as consolidated schools, shipping points, county parks, important mining and agricultural areas, etc. ; (2) link these places with nearby larger towns or cities, or with routes of higher classification; and (3) serve the more important intracounty travel corridors.

Minor collector roads.--These routes should: (1) Be spaced at intervals, consistent with population density, to collect traffic from local roads and bring all developed areas within a reasonable distance of a collector road; (2) provide service to the remaining smaller communities; and (3) link the locally important traffic generators with their rural hinterland.

Rural local road system

The rural local road system should have the following characteristics: (1) Serve primarily to provide access to adjacent land; and (2) provide service to travel over relatively short distances as compared to collectors or other higher systems. Local roads will, of course, constitute the rural mileage not classified as part of the principal arterial, minor arterial, or collector systems.

Extent of rural systems

The systems criteria above have been expressed primarily in qualitative, rather than quantitative terms. Because of varying geographic conditions (population density, spacing and size of cities, density and pattern of road network) it is not feasible to define uniform nationwide criteria on size of population centers, on trip length and traffic volume, or on spacing of routes, that would apply to all systems in all States. The results of classification studies conducted in many States throughout the country do, however, show considerable consistency in the relative extent of each system, expressed as a percentage of total rural road mileage.

Systems developed using the criteria herein are generally expected, in all States except Alaska and Hawaii, to fall within the percentage ranges shown in Table 11-2. The higher values in Table 11-2 would apply to States which have a less extensive total road network than is typical of States of similar population density. In States having a more extensive total network, the lower values would be expected to apply. The range of percentages for rural collectors is for the total mileage of both major and minor collector roads, and applies to the statewide rural mileage totals; the percentage in any particular county may vary considerably from the statewide average. Areas having an extensive grid pattern of roads will usually have a lesser percentage of collectors than areas wherein geographic conditions have imposed a restricted or less regular pattern of road development.

NO QUARRY
RV VILLAGE

NO QUARRY
RV VILLAGE
NoQuarryVillage.com

SECTION #10

Emergency Services

Item #10

Adequacy of Emergency Services and Their Ability to Service the Site

Please see attached letter from Tim Dietman, Sturgeon Bay Fire Chief and his email confirmation approving our plan showing adequate access requirements for fire fighting trucks. Please see attached plan that was reviewed by Fire Chief Dietman.

An additional item of installing a "Dry Hydrant" adjacent to the main pond was discussed and agreed to. The definition of a dry hydrant is a non-pressurized pipe assembly permanently installed in existing ponds, lakes, or streams permitting the withdrawal of water by firefighting equipment. Please see attached sketch. The obvious benefit of this dry hydrant is providing water for fire fighting protection in a fraction of the time in lieu of traveling outside the development to the nearest water main hydrant or other suitable source of water.

CITY of STURGEON BAY
FIRE DEPARTMENT

Tim Dietman
Fire Chief

421 Michigan St
Sturgeon Bay, WI 54235

920-746-2916 Station 920-746-2405 Office
920-559-7488 Cell
Email: tdietman@sturgeonbaywi.org

October 01, 2019

Tom Goelz
Quarry Bluff LLC
Re: Old Stone Quarry Project

Mr. Goelz,

Thank you for the preliminary plan for the proposed project atop the old stone quarry on Bay Shore Dr. Sturgeon Bay. I have reviewed the concept sewer and water plan which shows the dry hydrant from the proposed pond which will be a huge positive for fire protection within the project and surrounding community. All we require is the dry hydrant is installed to NFPA standards and an MOU is formed with the understanding we will have access 24/7/365 and the roads to the hydrant area will be maintained year-round. We look forward to future plans for review.

Tim Dietman
Sturgeon Bay Fire Chief

Gmail

Mike Parent <hksportsfields@gmail.com>

FW: Message from KM_C287

Tom Goelz <tom.goelz@gmail.com>
To: Mike Parent <mike@hksportsfields.com>, Pete Hurth <phurth@baudhuin.com>

Mon, Nov 11, 2019 at 8:07 AM

Tom Goelz
Principal
Nordic Project Management
P.O. Box 54
Fish Creek, WI 54212
Cell: +1(920) 421-1500

---------- Forwarded message ---------
From: **Dietman, Tim** <tdietman@sturgeonbaywi.org>
Date: Fri, Nov 1, 2019 at 3:27 PM
Subject: RE: FW: Message from KM_C287
To: Tom Goelz <tom.goelz@gmail.com>

Thanks Tom, look good.

Tim Dietman, Fire Chief

Sturgeon Bay Fire Department

421 Michigan St.

Sturgeon Bay, WI 54235

920-746-2405 Office

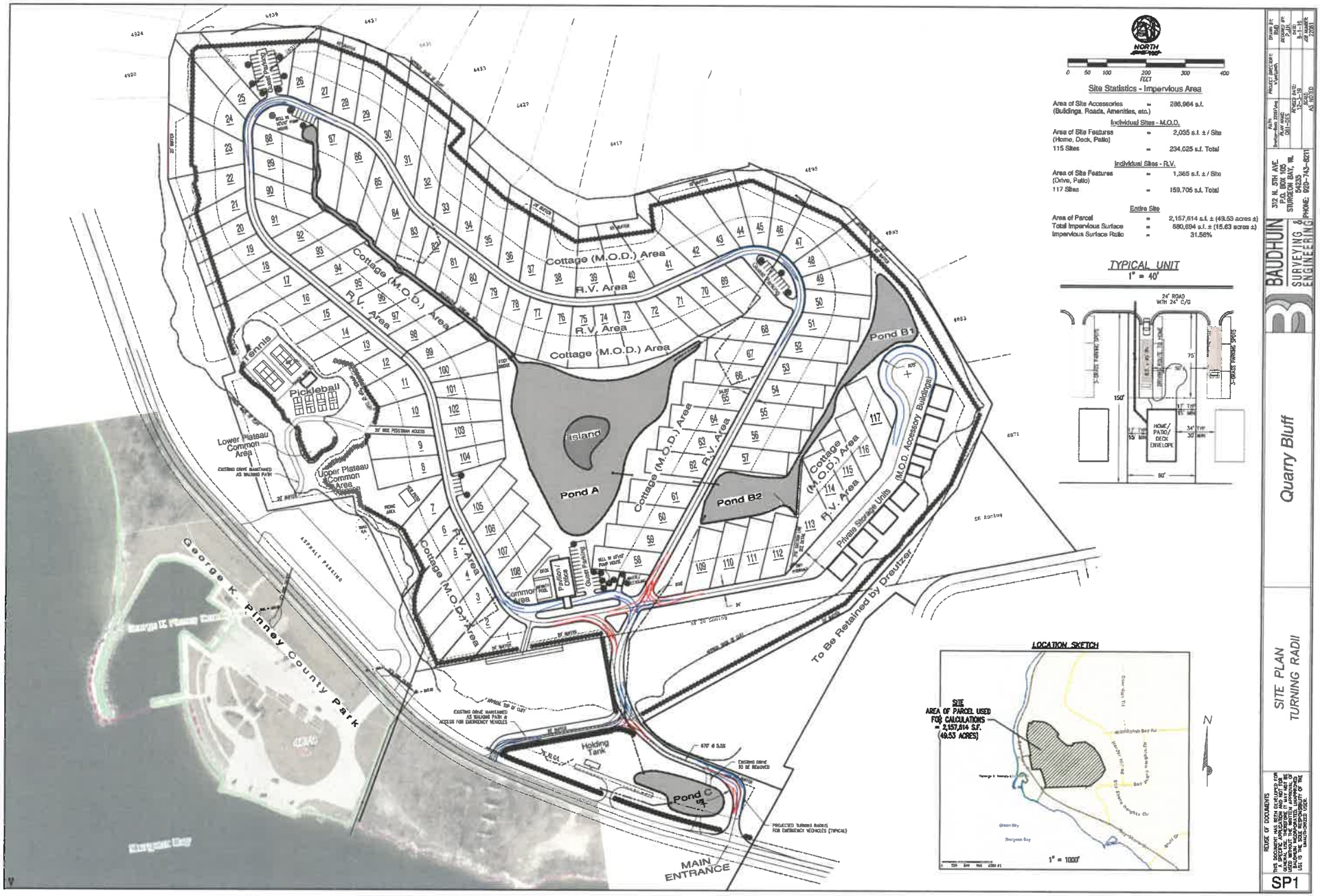
920-559-7488 Cell

920-746-2916 Station

tdietman@sturgeonbaywi.org

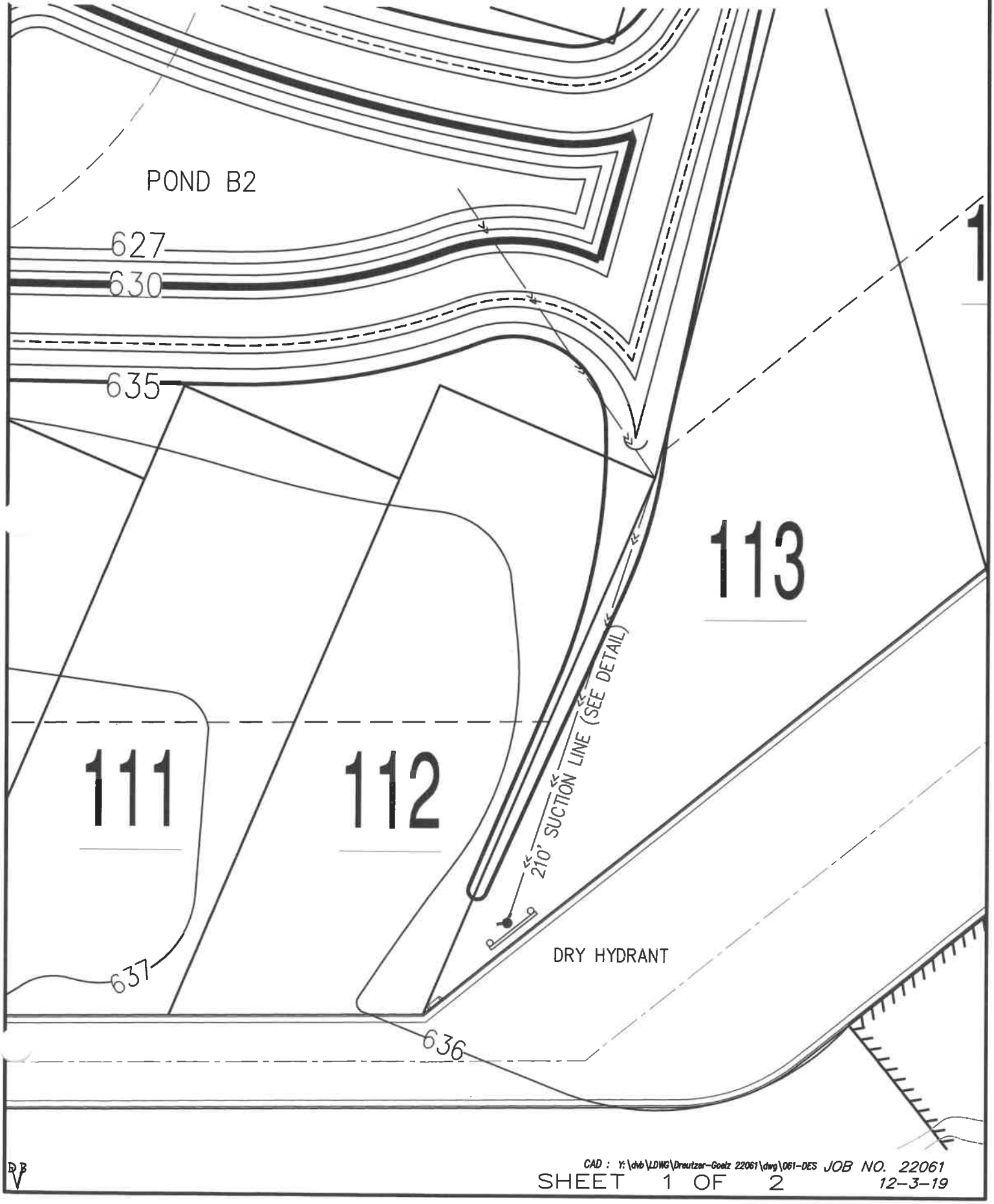
The Sturgeon Bay Fire Department's mission is to protect life and property from fire, medical, and environmental emergencies within our community, through public education, code management, and incident response.

From: Tom Goelz <tom.goelz@gmail.com>
Sent: Friday, November 1, 2019 10:16 AM
To: Dietman, Tim <tdietman@sturgeonbaywi.org>
Subject: Fwd: FW: Message from KM_C287


NORTH
0 50 100 200 300 400
FEET
Site Statistics - Impervious Area
Area of Site Accessories (Buildings, Roads, Amenities, etc.) = 286,964 s.f.
Individual Sites - M.O.D.
Area of Site Features (Home, Deck, Patio) = 2,035 s.f. ± / Site
115 Sites = 234,025 s.f. Total
Individual Sites - R.V.
Area of Site Features (Drive, Patio) = 1,365 s.f. ± / Site
117 Sites = 159,705 s.f. Total
Entire Site
Area of Parcel = 2,157,614 s.f. ± (49.53 acres ±)
Total Impervious Surface = 680,694 s.f. ± (15.63 acres ±)
Impervious Surface Ratio = 31.56%
TYPICAL UNIT
1" = 40'
24' ROAD WITH 24' C/G
HOME/ PATIO/ DECK ENVELOPE
LOCATION SKETCH
SITE
AREA OF PARCEL USED FOR CALCULATIONS = 2,157,614 S.F. (49.53 ACRES)
1" = 1000'
Cottage (M.O.D.) Area
R.V. Area
Pond A
Pond B1
Pond B2
Pond C
Island
Tennis
Pickleball
Lower Plateau Common Area
Upper Plateau Common Area
Common Area
Pavilion / Office
Guest Parking
Private Storage Units
(M.O.D. Accessory Buildings)
Holding Tank
George K. Pinney County Park
To Be Retained by Preutzer
MAIN ENTRANCE
PROJECTED TURNING RADIUS FOR EMERGENCY VEHICLES (TYPICAL)
BAUDHUIN
SURVEYING & ENGINEERING
312 N. 5TH AVE. SUITE 105
STURGEON BAY, WI. 54235
PHONE: 920-743-6211
Quarry Bluff
SITE PLAN
TURNING RADII
SP1

DRY HYDRANT

NO SCALE



DB

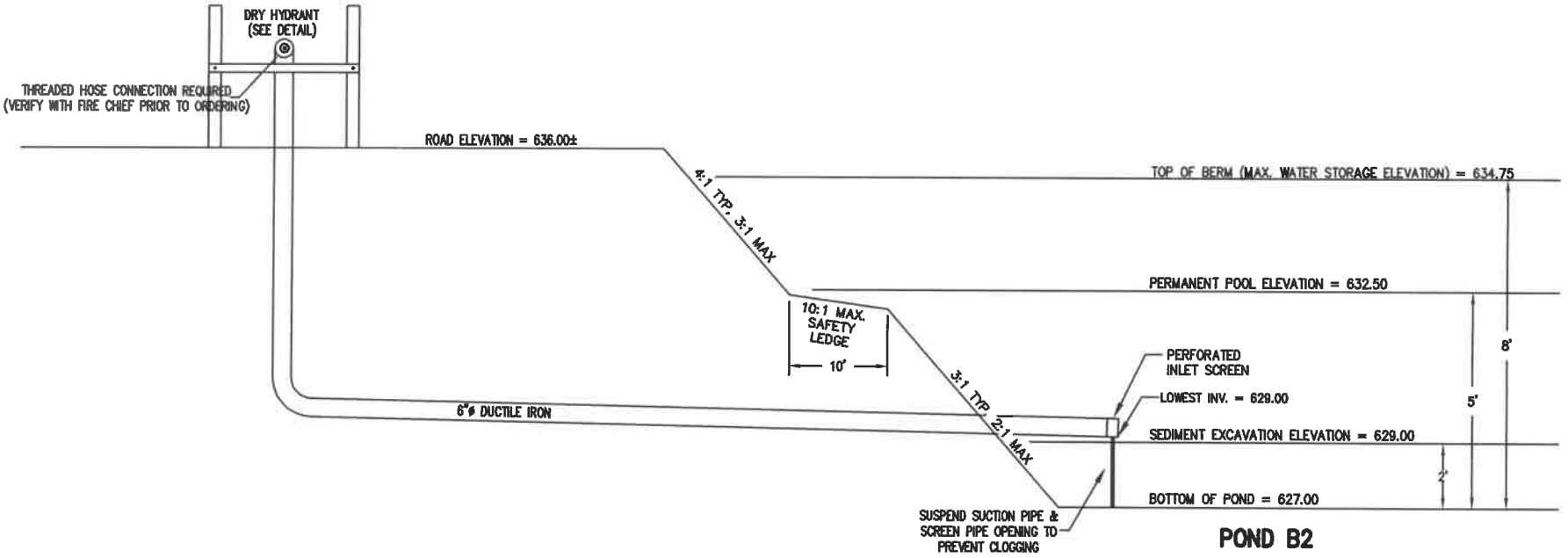
CAD : Y:\dvb\LDWG\Dreutzer-Goelz 22061\dwg\061-DES JOB NO. 22061

SHEET 1 OF 2

12-3-19

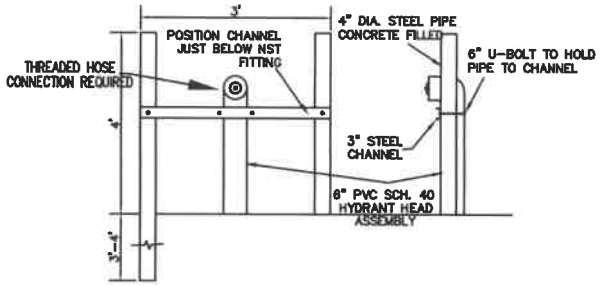
Dry Hydrant Suction Line Detail

NO SCALE



Dry Hydrant Detail

NO SCALE



NOTES:
-ELEVATION AND EXACT PLACEMENT TO BE REVIEWED WITH FIRE CHIEF PRIOR TO INSTALLATION.
- MATERIAL TO BE VERIFIED BY FIRE DEPARTMENT.

CAD : Y:\dwb\LDWG\Dreutzer-Goetz 22061\dwg\061-DES JOB NO. 22061
SHEET 2 OF 2 12-3-19

SECTION #11

Surface Water Drainage

Item #11

Provisions for Proper Surface Water Drainage:

An approved engineered stormwater and erosion control plan to be provided. Preliminary design by Baudhuin Engineering has determined that proper surface drainage will be accomplished through a series of stormwater ponds. Ponds will be lined with a geo-tech liner. Ponds to meet State of Wisconsin and Door County Soil and Water Conservation Department peak flow and water quality requirements.

A Wisconsin DNR land disturbance permit has been applied for. The stormwater management plan meets DNR requirements for peak flow reduction, as well as 80% suspended solids reduction.

The Door Soil & Water County Conservation Dept. performs a parallel review with the DNR. The county will issue a formal permit upon approval of the conditional use permit by the Resource Planning Commission.

In summary, we will be converting an existing solid exposed surface to a landscaped greenspace that will add filtration (see attached articles) and improve the potential for stormwater retention with the established soil layer. Curb and gutter will be installed throughout the development that will ensure that all stormwater/surface runoff will reach designed storm ponds for treatment.

BAUDHUIN
SURVEYING & ENGINEERING

Quarry Bluff

Stormwater Management Design
December 3, 2019

Location
Town of Sevastopol, Door County, Wisconsin

Prepared for:

Quarry Bluff, LLC
c/o Mike Parent
PO Box 889
Sister Bay, WI 54234

Prepared by:

Renee Borkovetz, P.E.
Baudhuin Surveying and Engineering
312 N. 5th Avenue
Sturgeon Bay, WI 54235
(920) 743-8211
rborkovetz@baudhuin.com

Section	Description
1	Stormwater Summary
2	Stormwater Management Design
3	Storm Pond Output
4	Pre-Developed TR-55
5	Post-Developed TR-55
6	Water Quality Analysis
7	Reference Materials

SECTION #1

Stormwater Summary

Stormwater Summary

I. Site Description

The project site is an old stone quarry located east of Bay Shore Drive across from George K. Pinney County Park in the Town of Sevastopol, Door County, Wisconsin. The proposed 57.02-acres will be developed into a Luxury Motorcoach Resort with 117 units. Units will include a permanent cottage and parking for a motorcoach.

II. Existing (Pre-Developed) Conditions

The existing site is an old stone quarry excavated into the bedrock bluff east of County Highway B/Bay Shore Drive. The main floor of the quarry ranges in elevation from 632 to 648 feet. East end of this quarry is the top of the bluff with Bay Shore Drive elevation being approximately 595 feet. West end of this quarry is the base of the bluff with top of the bluff being approximately 700 feet consisting of residential development.

The project site within the quarry consists of dolomitic limestone bedrock. The south entrance to this project site at Bay Shore Drive consists of gravelly sandy loam with bedrock depth greater than 80-inches, as verified by soil borings performed.

The water level in Green Bay is approximately 582.2 feet on July 18, 2019 per NOAA water level data. Groundwater at the project site south entrance at Bay Shore Drive is estimated to be at elevation 584.0 feet, about 10 feet below ground surface. Maximum groundwater within the quarry is estimated to be at elevation 588.5 feet, about 50 feet below ground surface. There are no wetlands within this project site.

Green Bay is within 500' of this development. Ultimate outflow from this project site is infiltrated and directed to Green Bay. Stormwater runoff infiltrates through bedrock fractures but there exists some ponding in areas where bedrock surface is depressed and does not infiltrate as quickly as majority of the bedrock surface. These ponding areas have been accounted for in stormwater calculations to assume worst case conditions.

Steep and shear bedrock bluffs surround this project site. Slopes on the main quarry floor of the project site range between 0.5% and 3%.

Offsite watersheds above the bedrock bluff east and south of the project site drain through this site and have been taken into account in the stormwater design. This offsite area is approximately 32.2 acres and consists of residential development.

III. Proposed (Post-Developed) Conditions

The proposed development will include approximately 117 units with each unit having a permanent cottage and motorcoach pad. Common areas include access roads, parking lots, office building, and recreational spaces.

Stormwater runoff from the proposed project site will follow similar drainage patterns as pre-developed conditions. Stormwater will be directed to on-site storm ponds by means of sheet flow, curb and gutter, grass swales, and culverts. Wet detention ponds have been designed to control peak flow rates and provide water quality treatment. Ultimate

discharge from this development will be directed west to Bay Shore Drive and the existing storm sewer discharging to Green Bay.

IV. Erosion Control

The erosion control for this site has been designed to conform with DNR Technical Standards and County requirements. Maintenance and installation of erosion control practices shall follow DNR Technical Standards and County requirements.

V. Conclusion

Implementation of the designed stormwater management plan and erosion control practices will provide a stormwater system that will minimize any negative impacts of this development downstream. This design reduces peak flow rates and removes total suspended solids prior to discharge in accordance with DNR and County requirements.

SECTION #2

Stormwater Management Design

Stormwater Management Design

I. Goals

The goals of the proposed stormwater management design are to:

- Reduce peak flow rates so that post-developed rates be less than or equal to pre-developed rates for the 1- and 2-year storm events, per DNR standards.
- Reduce total suspended solids (TSS) by 80% for the post-developed site with stormwater control practices as compared to the post-developed site without any control practices for a new development site, per DNR standards.
- County requires peak flow rates and TSS reductions be the same as DNR standards.
- Design an erosion control plan in accordance with the Wisconsin DNR Technical Standards and County requirements.

II. Design Methodology

Peak flow rates and water quality have been modeled to analyze net impact of the proposed development leaving the site. The stormwater management system has been designed using the following methods:

- Peak flow rates—Hydraflow program (US-SCS TR-55 hydrology method).
- Water quality analysis—WinSLAMM program (small storm hydrology method)

Peak flow analysis of the project site requires the following input data:

- Pre-developed curve number for the quarry is 70 due to the runoff and infiltration properties of the fractured nature of the dolomitic limestone bedrock in this area. Grass, underbrush, wooded areas use curve number 58 per County standards for hydrologic soil group B.
- Offsite areas that are residential development use a curve number of 61. Offsite areas that are wooded use a curve number of 55 per DNR standards for hydrologic soil group B.
- Use Type II rainfall distribution with 24-hour rainfall depths for Door County, as follows:

Table 1: Door County Design Rainfall (in)

Year	Rainfall Depth (inches)
1	2.2
2	2.4
5	3.1
10	3.6
25	4.1
50	4.6
100	4.9

This project site is exempt from infiltration requirements due to bedrock depth at the quarry surface and soil mottling indicators near Bay Shore Drive.

III. Peak Flow Rate Analysis

Peak flow rates for pre- and post-developed conditions of the project site were determined utilizing TR-55 methods coupled with Hydraflow software. Weighted average curve numbers (CN) were used for each watershed basin in the analysis. Curve number computations are as follows:

Table 2: Pre-Developed Curve Numbers

Watershed	Total Area (ac)	Area (ac)					
		Offsite Res. CN = 61	Offsite Woods CN = 55	Imperv. CN = 98	Bedrock CN = 70	Grass/ Wooded CN = 58	Weighted CN
Basin 1	21.8	—	—	—	21.8	—	**70**
Basin 2	13.3	—	—	—	13.3	—	**70**
Basin 3	1.8	—	—	—	1.8	—	**70**
Basin 4	12.1	—	—	—	12.1	—	**70**
Basin 5	5.7	—	—	0.2	1.7	3.8	**63**
Basin 6 (offsite to 1)	30.5	30.5	—	—	—	—	**61**
Basin 7 (offsite to 2)	1.7	—	1.7	—	—	—	**55**

Table 3: Post-Developed Curve Numbers

Watershed	Total Area (ac)	Area (ac)				
		Offsite Res. CN = 61	Offsite Woods CN = 55	Roof / Paved CN = 98	Lawn (Soil B) CN = 69	Weighted CN
Basin 1	29.7	—	—	8.8	20.9	**78**
Basin 2	10.0	—	—	3.2	6.8	**78**
Basin 3	0.8	—	—	0.2	0.6	**77**
Basin 4	4.7	—	—	1.5	3.2	**78**
Basin 5	9.5	—	—	2.0	7.5	**75**
Basin 6 (offsite to 1)	20.3	20.3	—	—	—	**61**
Basin 7 (offsite to 2)	11.1	11.1	—	—	—	**61**
Basin 8 (offsite to 5)	0.8	—	0.8	—	—	**55**

IV. Stormwater Management Practices Design

Stormwater runoff from this post-developed project site will be directed to storm ponds which have been designed to reduce peak flow rates and provide water quality treatment. Basins 1 and 6 (offsite) runoff will be directed to wet detention Pond A with outflow to Pond B2. Basins 2 and 7 (offsite) runoff will be directed to wet detention Ponds B1 and B2. Pond B2 overflows to wet detention Pond C. Basins 3 and 4 runoff will continue to be undetained and follow similar drainage patterns compared to pre-developed conditions. Basins 5 and 8 (offsite) runoff will be directed to Pond C. Discharge from Pond C will be directed to the existing storm sewer crossing Bay Shore Drive leading to Green Bay.

Wet detention ponds have been designed in general accordance with DNR technical standard 1001 *Wet Detention Pond*. These ponds have been designed to maintain 2 feet minimum of sediment storage capacity with 3 feet minimum of wet pool.

No dry detention ponds for infiltration are included in this stormwater design. Bedrock depth and soil redox indicators limited dry detention pond design along with achieving required minimum total suspended solids reduction for water quality purposes.

1. Peak Flow Results

Pre-developed peak flow rates calculated using TR-55 modeling were further reduced to account for existing ponding present in some areas on the bedrock surface. Total existing volume of ponding was estimated for each basin. Enclosed is Appendix B from DNR Technical Standard 1001, *Wet Detention Pond*. This graph provides the relationship between peak flow rates and volume. Table 4 provides reduced peak flow rates for pre-developed conditions. Using the reduced peak flow rates in the stormwater analysis provides a conservative design.

Table 4: Pre-Developed Project Site Net Peak Flow Rates

Storm	V storage (CF)	V runoff (CF)	Vs/Vr	qo/qi	q in (cfs)	q out (cfs)
1	27020	72142	0.37	0.31	11.16	3.46
2	27020	94181	0.29	0.47	16.12	7.58
5	27020	190544	0.14	0.84	38.40	32.26
10	27020	272633	0.10	0.88	57.50	50.60
25	27020	363655	0.07	0.92	78.61	72.32
50	27020	462025	0.06	0.93	101.43	94.33
100	27020	524086	0.05	0.94	115.82	108.87

Post-developed drainage patterns and proposed stormwater ponds and outlet structures have been sized to reduce peak flow rates. As a result, post-developed peak flow rates are less than pre-developed for all storm events, meeting DNR and County standards. Refer to enclosed TR-55 output and results tables below for peak flow rates leaving the project site.

Table 5: Project Site Net Peak Flow Rates (cfs)

Storm	Pre-Developed	Post-Developed
1	3.46	2.99
2	7.58	3.75
5	32.26	6.62
10	50.60	8.85
25	72.32	11.18
50	94.33	13.57
100	108.87	16.09

Stormwater management for George K. Pinney County Park, east of this proposed development, was designed and constructed around 2004. Part of the design includes a dry detention pond east of the parking lot and Bay Shore Drive. This detention pond was designed to route off-site stormwater runoff around the County Park's project site and stormwater management system. The off-site

stormwater totaled 19.2 acres and included partial areas from the quarry project site.

Stormwater runoff from Watershed Basins 3 and 4 from this project site are directed towards the County Park by-pass detention pond as part of its offsite watershed. The stormwater design for this proposed development reduced the area of these basins, therefore reducing the peak flow rates for post-developed conditions to be less than pre-developed for all storm events up to and including the 100-year storm. Therefore, this proposed development will not negatively impact the County Park's stormwater management system. Table 6 presents data for reducing pre-developed peak flow rates due to existing ponding. See Table 7 and TR-55 output for peak flow summary from this project site towards the County Park by-pass pond.

Table 6: Basins 3 and 4 Net Peak Flow Rates (cfs)

Storm	V storage (CF)	V runoff (CF)	Vs/Vr	qo/qi	q in (cfs)	q out (cfs)
1	1870	15155	0.12	0.86	3.86	3.32
2	1870	19290	0.10	0.88	5.31	4.67
5	1870	36447	0.05	0.94	11.92	11.20
10	1870	50631	0.04	0.95	17.47	16.60
25	1870	66075	0.03	0.96	23.46	22.52
50	1870	82539	0.02	0.97	29.82	28.93
100	1870	92832	0.02	0.97	33.77	32.76

Table 7: Basins 3 and 4 Net Peak Flow Rates (cfs)

Storm	Pre-Developed	Post-Developed
1	3.32	2.95
2	4.67	3.67
5	11.20	6.48
10	16.60	8.66
25	22.52	10.95
50	28.93	13.31
100	32.76	14.76

Refer to TR-55 results and the enclosed stormwater construction plan set for pond details and elevations.

2. Water Quality Results

Water quality of the post-developed project site was analyzed using WinSLAMM program. Treatment measures applied include wet detention ponds.

Approximately 32.2 acres of stormwater runoff from off-site is directed through this project site. For this analysis, pollutants from these areas are not included in the net TSS reduction, but the volume of water runoff from this area is accounted for in the model.

TSS reduction is 80.11% which meets the minimum 80% reduction required for a new development project site, therefore meeting DNR and County requirements. See enclosed printouts for water quality analysis results.

V. Construction Notes

A. Temporary Dewatering (if needed, not anticipated)

- Geotextile bag shall be used in lieu of basin in accordance with Code 1061.
- Bedrock and loamy sand soils on site. Select 0.150 mm AOS geotextile bag.
- Geotextile bag shall be securely attached to the discharge pipe.

B. Temporary Sediment Basin

All wet detention Ponds A, B1, B2, and C are to be used as sediment basins during construction and site disturbance. A sediment excavation level has been established in these ponds to ensure wet pool capacity.

Refer to stormwater construction plan set for additional details and notes.

C. Erosion Control

Refer to stormwater construction plan set for erosion control practices, locations, and directives. All erosion control practices are to be installed and maintained in accordance with DNR technical standards.

VI. Conclusion

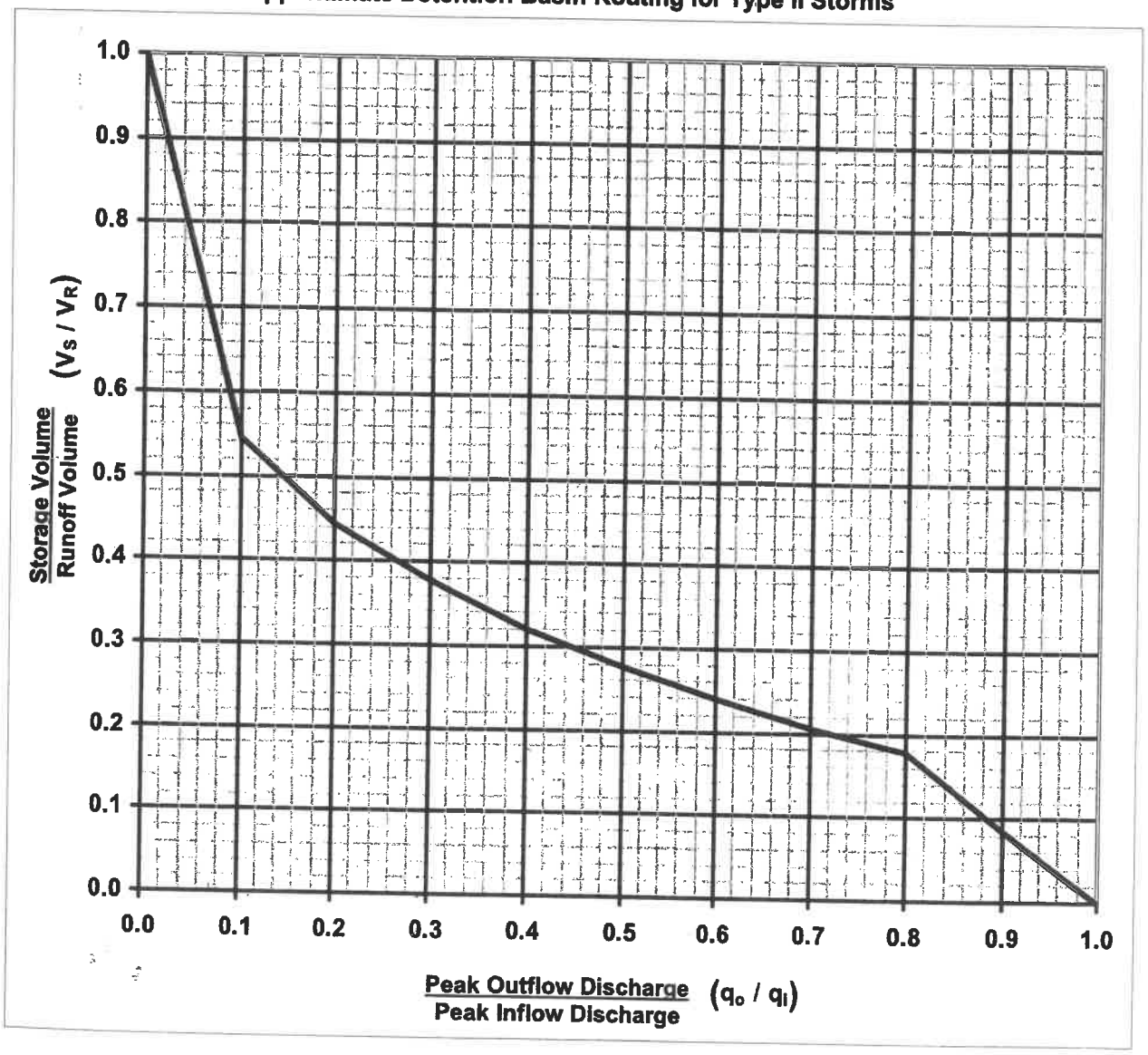
The stormwater management system for this project site has been designed to minimize any negative net impact from this development to downstream properties and waterways. The design has accounted for reducing peak flow rates due to post-developed conditions and providing water quality treatment measures. This design meets both DNR and County stormwater management requirements and goals.

$y = -4.6x + 1$

$y = 1 - 4.6x$ $\quad x = -\frac{y-1}{4.6}$

Appendix B

Approximate Detention Basin Routing for Type II Storms

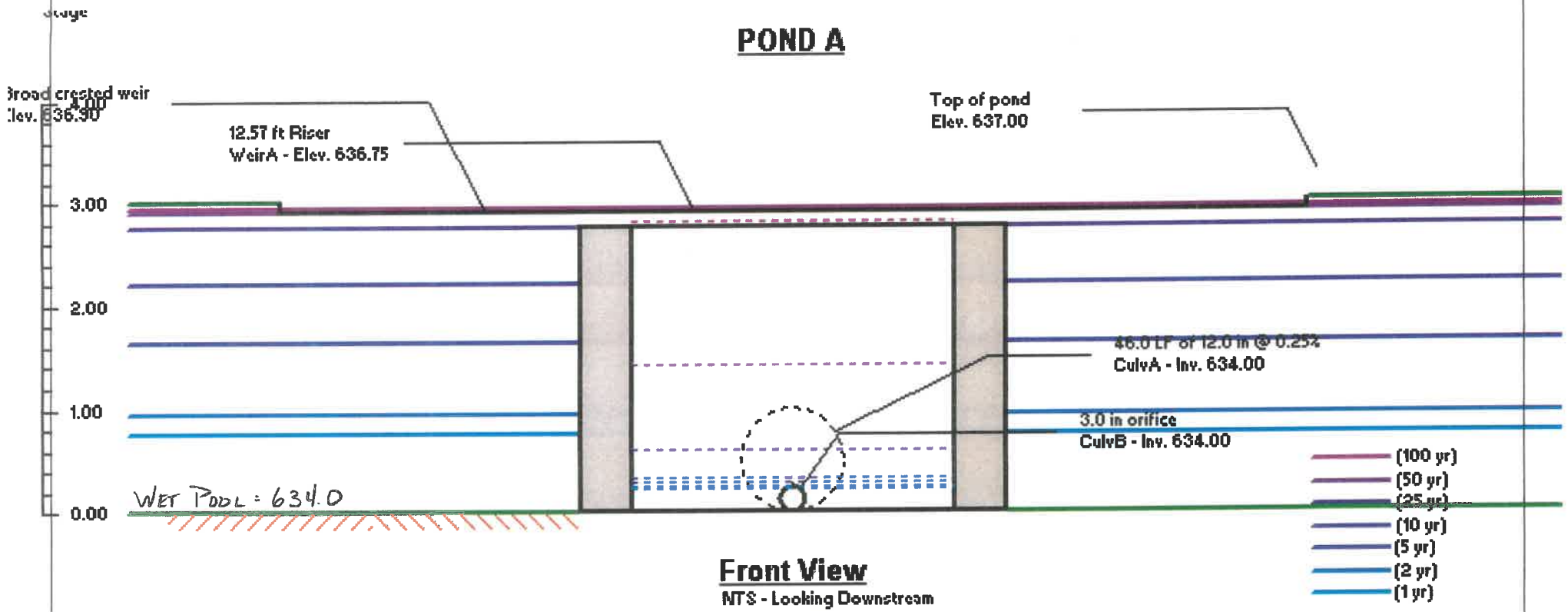


Source: Technical Release 55, United States Department of Agriculture, Natural Resources Conservation Service, Washington, D.C. 1986. NRCS Bulletin No. WI-210-8-16 (Sept. 12, 1988) amended the TR-55 routing graph for Type II storms to include flows outside the original range.

SECTION #3

Storm Pond Output

POND A



Front View

NTS - Looking Downstream

Schematic only. Not for construction.

Pond Report

Hydraflow Hydrographs by Intelisolve

Tuesday, Dec 3 2019, 9:35 PM

Pond No. 1 - POND A

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	634.00	80,970	0	0
1.00	635.00	88,750	84,860	84,860
2.00	636.00	96,720	92,735	177,595
3.00	637.00	105,520	101,120	278,715

Culvert / Orifice Structures

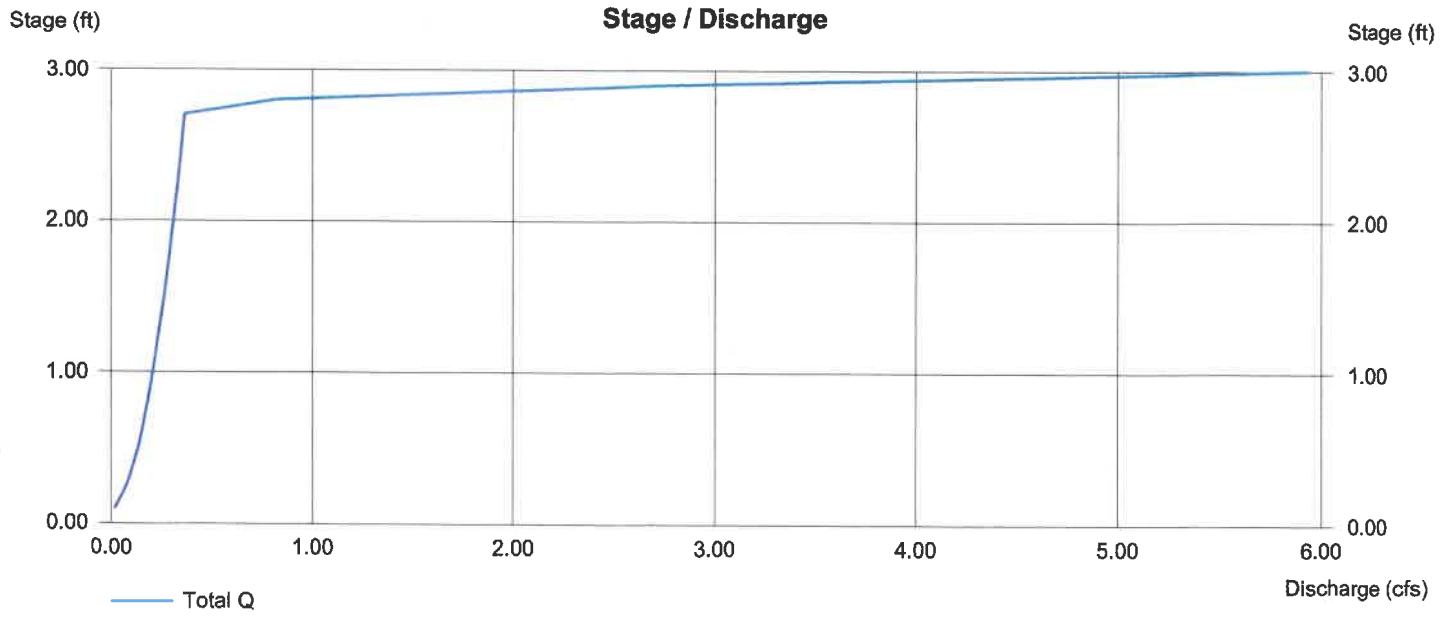
	[A]	[B]	[C]	[D]
Rise (in)	= 12.00	3.00	0.00	0.00
Span (in)	= 12.00	3.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 634.00	634.00	0.00	0.00
Length (ft)	= 46.00	0.00	0.00	0.00
Slope (%)	= 0.25	0.00	0.00	0.00
N-Value	= .013	.013	.013	.013
Orif. Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 12.57	10.00	0.00	0.00
Crest El. (ft)	= 636.75	636.90	0.00	0.00
Weir Coeff.	= 3.33	2.60	0.00	0.00
Weir Type	= Riser	Broad	---	---
Multi-Stage	= Yes	No	No	No

Exfiltration = 0.000 in/hr (Contour) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control. Weir riser checked for orifice conditions.



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Tuesday, Dec 3 2019, 9:35 PM

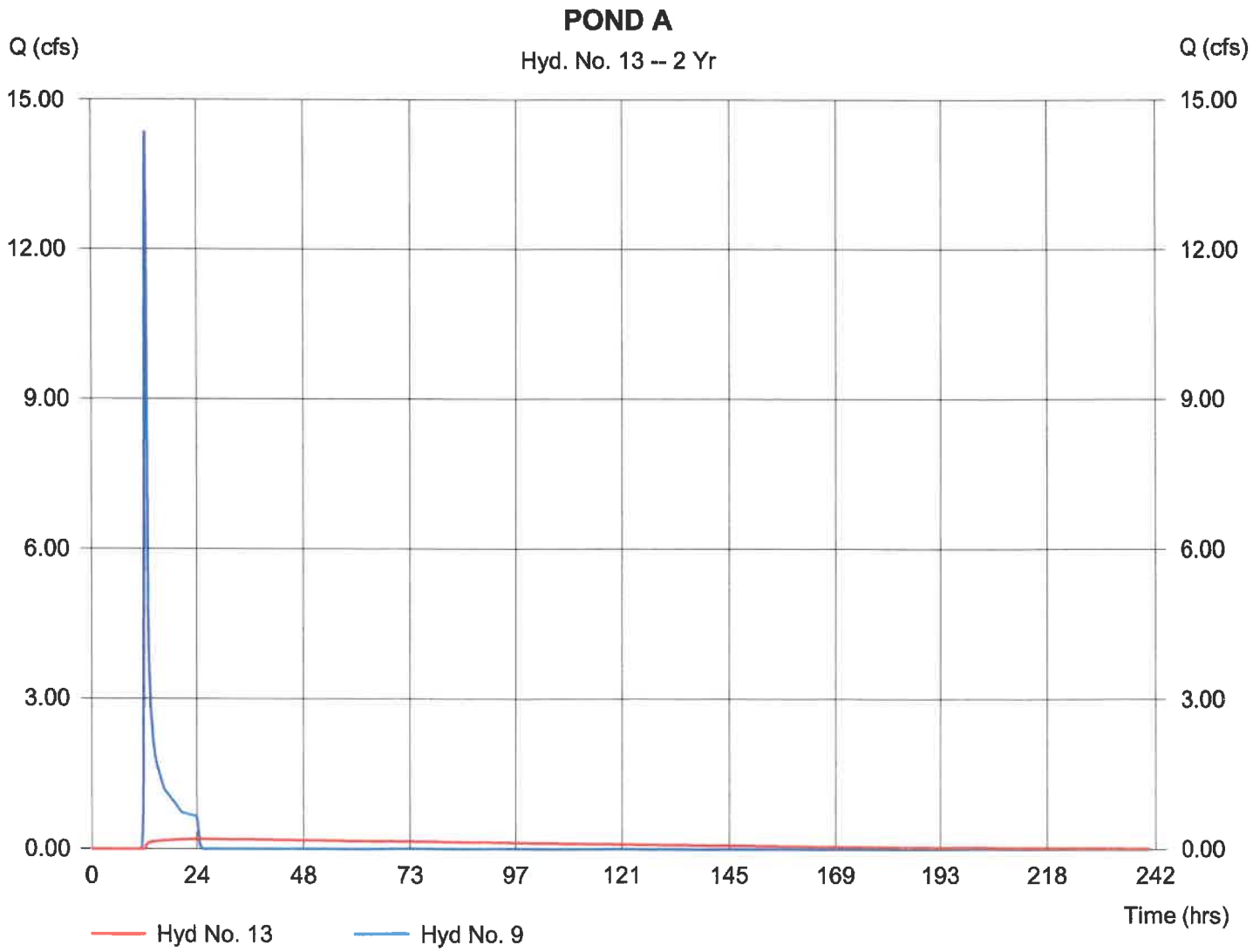
Hyd. No. 13

POND A

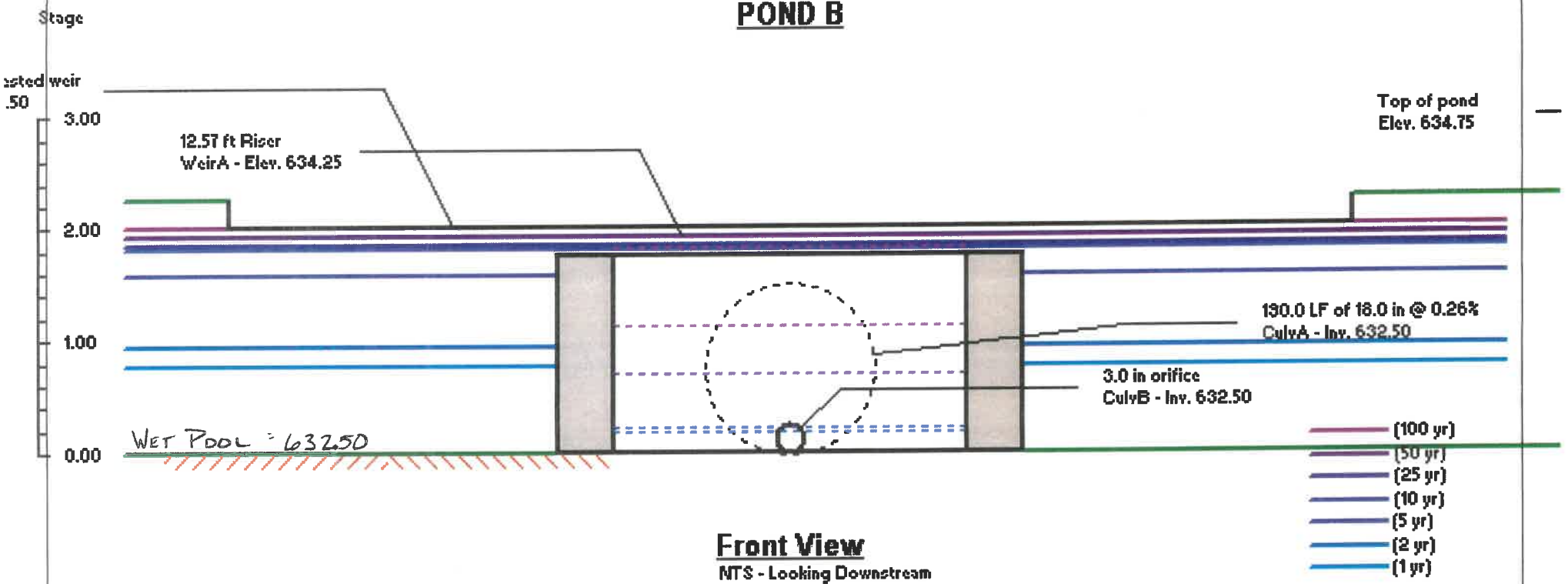
Hydrograph type	= Reservoir	Peak discharge	= 0.20 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Inflow hyd. No.	= 9	Max. Elevation	= 634.95 ft
Reservoir name	= POND A	Max. Storage	= 80,573 cuft

Storage Indication method used.

Hydrograph Volume = 79,939 cuft



POND B



Front View

NTS - Looking Downstream

Schematic only. Not for construction.

Pond Report

Hydraflow Hydrographs by Intelisolve — Tuesday, Dec 3 2019, 9:36 PM

Pond No. 2 - POND B

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	632.50	18,585	0	0
0.50	633.00	37,315	13,975	13,975
1.50	634.00	44,250	40,783	54,758
2.25	634.75	49,940	35,321	90,079

Culvert / Orifice Structures

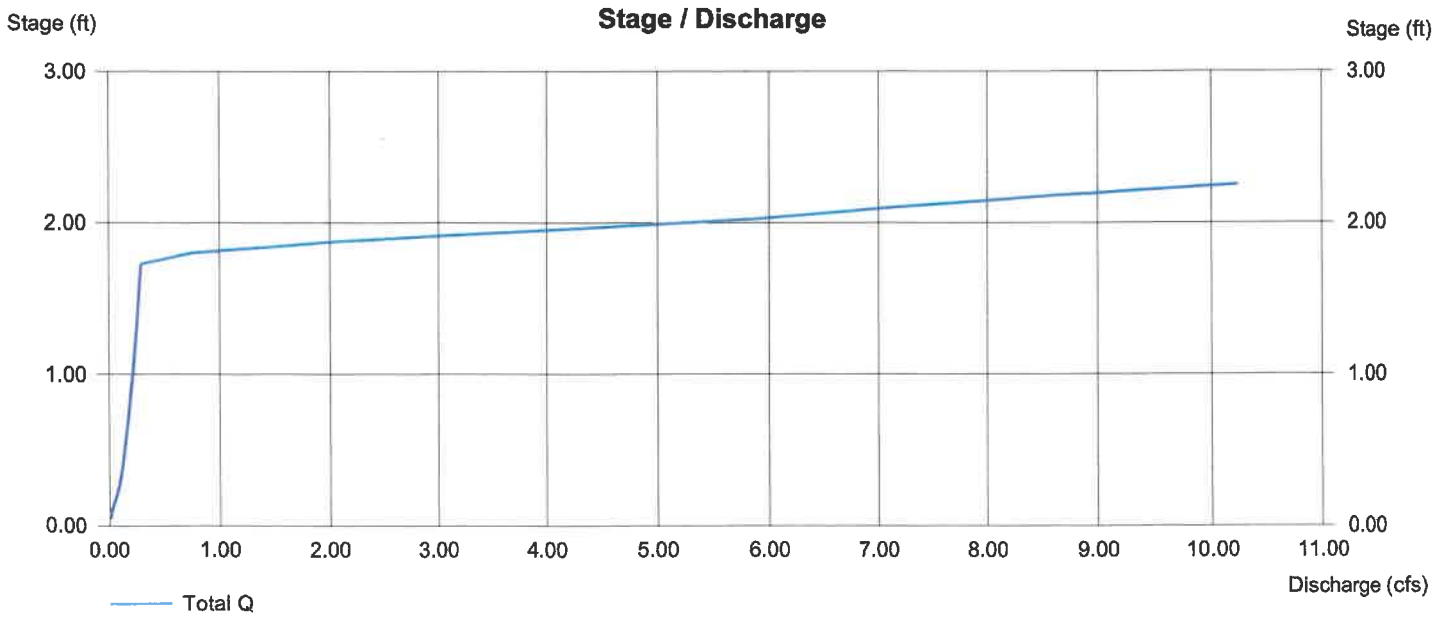
	[A]	[B]	[C]	[D]
Rise (in)	= 18.00	3.00	0.00	0.00
Span (in)	= 18.00	3.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 632.50	632.50	0.00	0.00
Length (ft)	= 190.00	0.00	0.00	0.00
Slope (%)	= 0.26	0.00	0.00	0.00
N-Value	= .013	.013	.013	.013
Orif. Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 12.57	10.00	0.00	0.00
Crest El. (ft)	= 634.25	634.50	0.00	0.00
Weir Coeff.	= 3.33	2.60	0.00	0.00
Weir Type	= Riser	Broad	---	---
Multi-Stage	= Yes	No	No	No

Exfiltration = 0.000 in/hr (Contour) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control. Weir riser checked for orifice conditions.



Hydrograph Plot

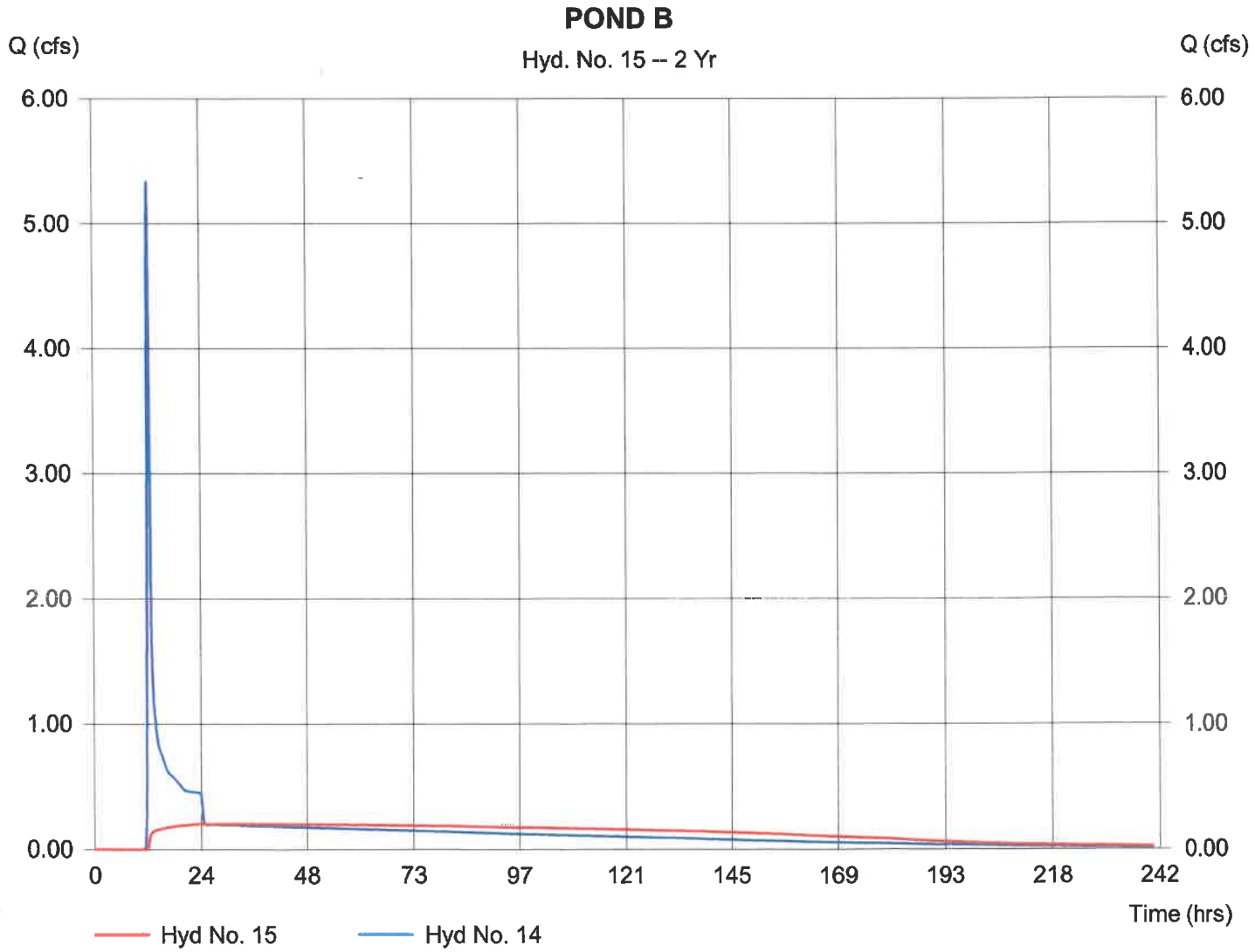
Hydraflow Hydrographs by Intelisolve | Tuesday, Dec 3 2019, 9:36 PM

Hyd. No. 15

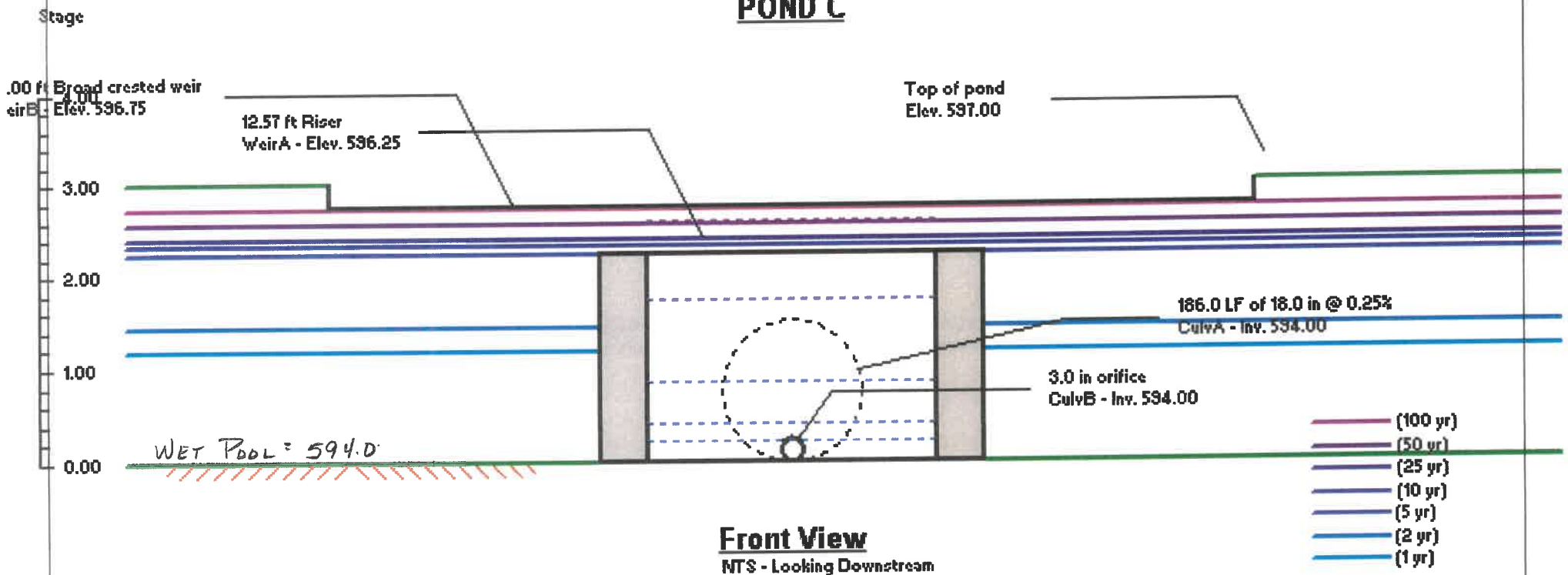
POND B

Hydrograph type	= Reservoir	Peak discharge	= 0.20 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Inflow hyd. No.	= 14	Max. Elevation	= 633.44 ft
Reservoir name	= POND B	Max. Storage	= 31,934 cuft

Storage Indication method used. | Hydrograph Volume = 108,872 cuft



POND C



Front View

NTS - Looking Downstream

Schematic only. Not for construction.

Pond Report

Hydraflow Hydrographs by Intelisolve

Tuesday, Dec 3 2019, 9:36 PM

Pond No. 4 - POND C

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	594.00	11,150	0	0
1.00	595.00	12,710	11,930	11,930
2.00	596.00	14,320	13,515	25,445
3.00	597.00	16,000	15,160	40,605

Culvert / Orifice Structures

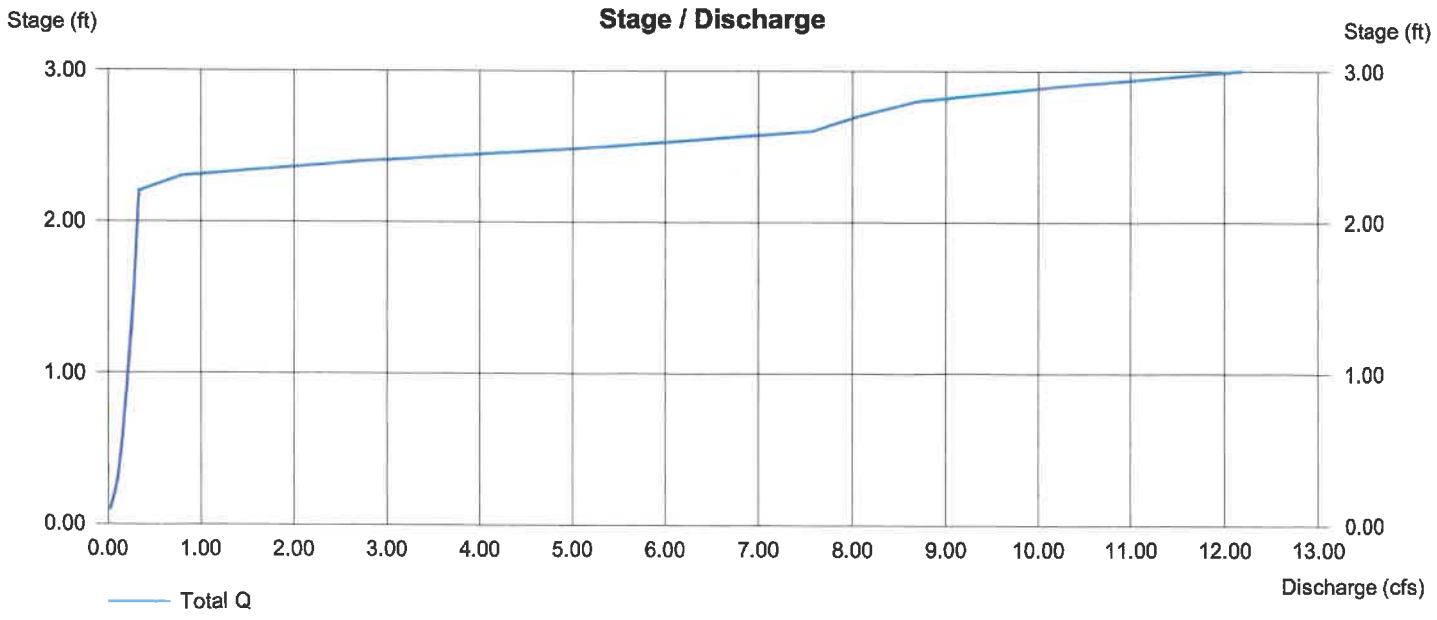
	[A]	[B]	[C]	[D]
Rise (in)	= 18.00	3.00	0.00	0.00
Span (in)	= 18.00	3.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 594.00	594.00	0.00	0.00
Length (ft)	= 186.00	0.00	0.00	0.00
Slope (%)	= 0.25	0.00	0.00	0.00
N-Value	= .013	.013	.013	.013
Orif. Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 12.57	10.00	0.00	0.00
Crest El. (ft)	= 596.25	596.75	0.00	0.00
Weir Coeff.	= 3.33	2.60	0.00	0.00
Weir Type	= Riser	Broad	---	---
Multi-Stage	= Yes	No	No	No

Exfiltration = 0.000 in/hr (Contour) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control. Weir riser checked for orifice conditions.



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Tuesday, Dec 3 2019, 9:36 PM

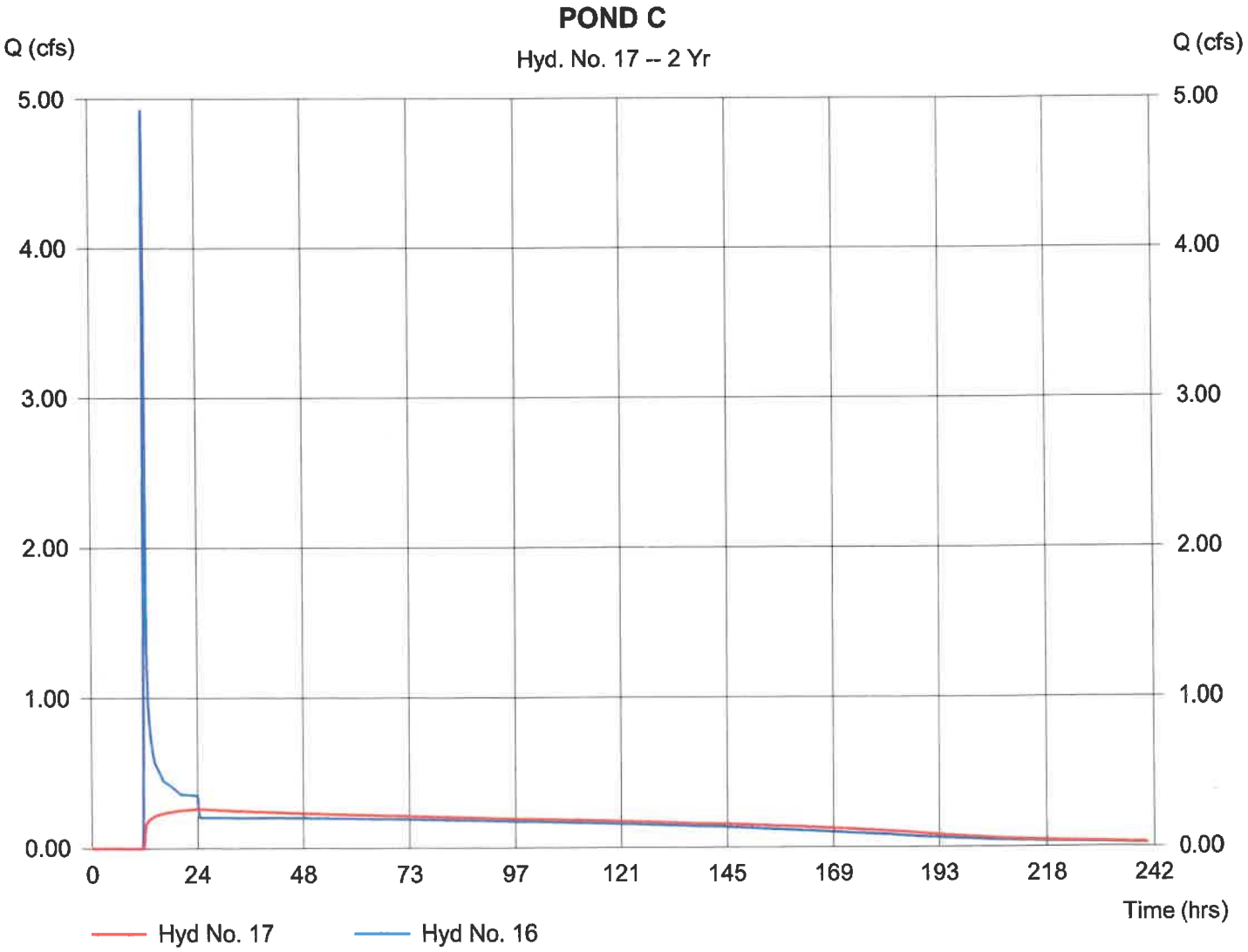
Hyd. No. 17

POND C

Hydrograph type	= Reservoir	Peak discharge	= 0.26 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Inflow hyd. No.	= 16	Max. Elevation	= 595.45 ft
Reservoir name	= POND C	Max. Storage	= 18,018 cuft

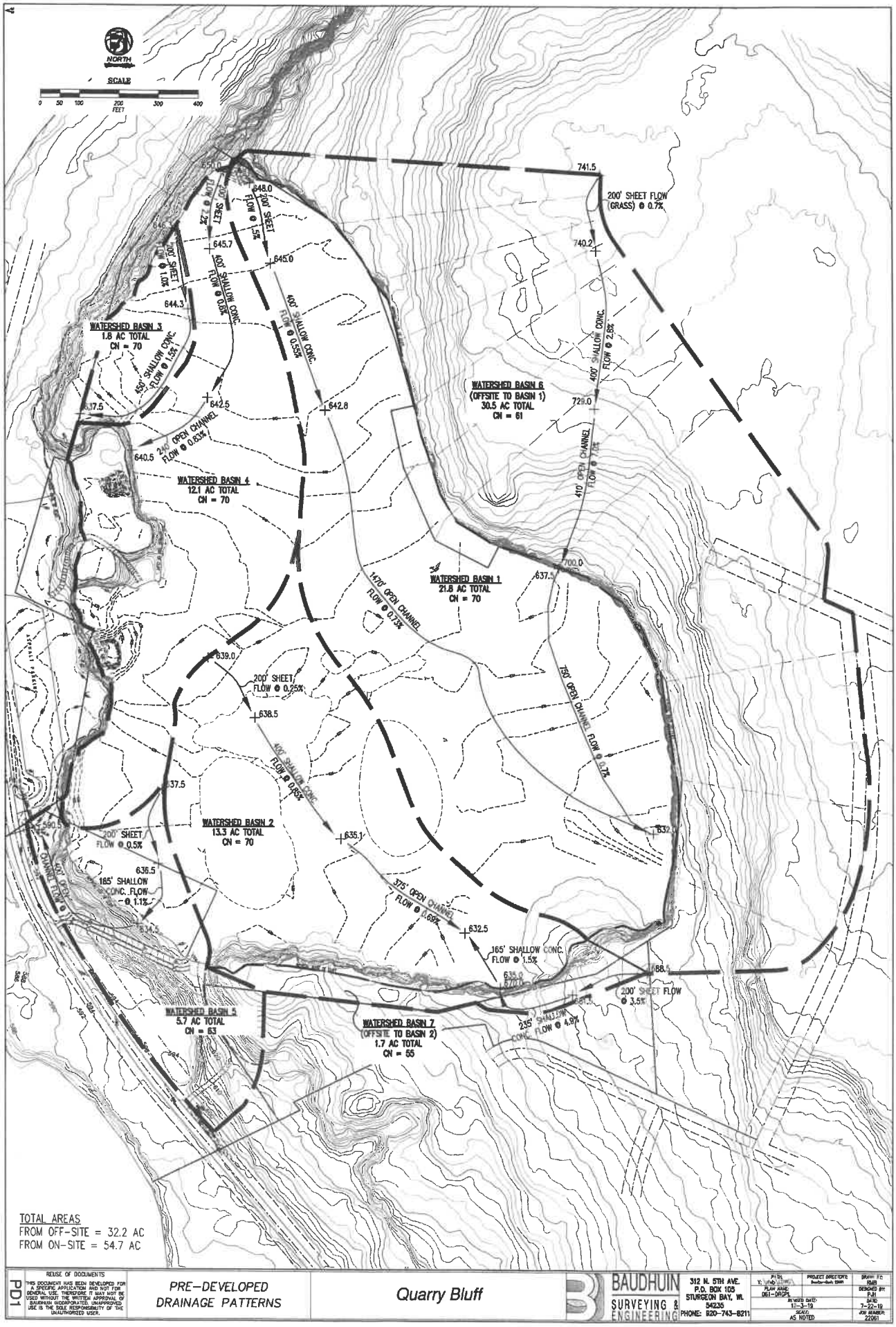
Storage Indication method used.

Hydrograph Volume = 128,018 cuft



SECTION #4

Pre-Developed TR-55


NORTH
SCALE
0 50 100 200 300 400
FEET
WATERSHED BASIN 1
21.8 AC TOTAL
CN = 70
WATERSHED BASIN 2
13.3 AC TOTAL
CN = 70
WATERSHED BASIN 3
1.8 AC TOTAL
CN = 70
WATERSHED BASIN 4
12.1 AC TOTAL
CN = 70
WATERSHED BASIN 5
5.7 AC TOTAL
CN = 63
WATERSHED BASIN 6
(OFFSITE TO BASIN 1)
30.5 AC TOTAL
CN = 61
WATERSHED BASIN 7
(OFFSITE TO BASIN 2)
1.7 AC TOTAL
CN = 55
200' SHEET FLOW (GRASS) @ 0.7%
400' SHALLOW CONC. FLOW @ 2.6%
410' OPEN CHANNEL FLOW @ 1.1%
1470' OPEN CHANNEL FLOW @ 0.73%
750' OPEN CHANNEL FLOW @ 0.7%
200' SHEET FLOW @ 0.25%
400' SHALLOW CONC. FLOW @ 0.48%
375' OPEN CHANNEL FLOW @ 2.69%
165' SHALLOW CONC. FLOW @ 1.5%
200' SHEET FLOW @ 3.5%
235' SHALLOW CONC. FLOW @ 4.9%
185' SHALLOW CONC. FLOW @ 1.1%
200' SHEET FLOW @ 0.5%
400' SHALLOW CONC. FLOW @ 0.55%
240' OPEN CHANNEL FLOW @ 0.83%
455' SHALLOW CONC. FLOW @ 1.5%
200' SHEET FLOW @ 1.5%
200' SHEET FLOW @ 2.2%
741.5
740.2
729.0
700.0
648.0
645.7
645.0
644.3
642.8
642.5
640.5
639.0
638.5
637.5
635.1
634.5
632.5
TOTAL AREAS
FROM OFF-SITE = 32.2 AC
FROM ON-SITE = 54.7 AC
PD1
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PROJECT DIRECTORY
PLAN NAME:
061-DRDPL
REVISED DATE:
11-3-19
SCALE:
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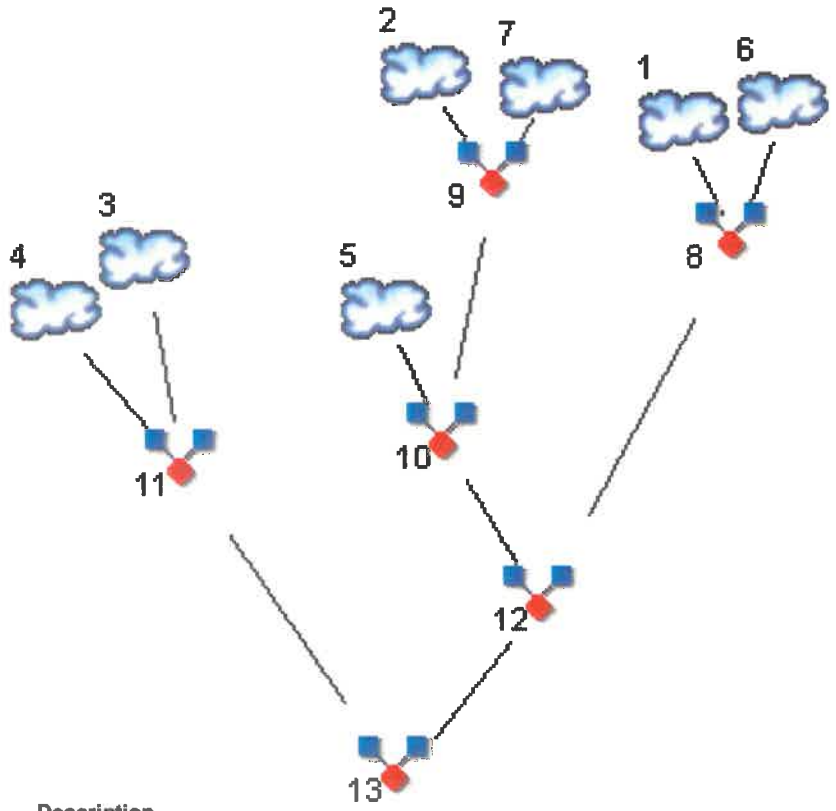
DRAWN BY:
BJH
DESIGNED BY:
PJH
DATED:
7-22-19
JOB NUMBER:
22061



Legend

Hyd.	Origin	Description
1	SCS Runoff	PRE-1
2	SCS Runoff	PRE-2
3	SCS Runoff	PRE-3
4	SCS Runoff	PRE-4
5	SCS Runoff	PRE-5
6	SCS Runoff	PRE-1 OFFSITE
7	SCS Runoff	PRE-2 OFFSITE
8	Combine	PRE 1 TOTAL
9	Combine	PRE 2 TOTAL
10	Combine	Pre 1 & 5 Total
11	Combine	PARK TOTAL
12	Combine	TOTAL AT ENT
13	Combine	Total Site

Hydrograph Return Period Recap

d. .o.	Hydrograph type (origin)	Inflow Hyd(s)	Peak Outflow (cfs)								Hydrograph description
			1-Yr	2-Yr	3-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr	
1	SCS Runoff	------	4.75	6.62	-------	14.63	21.70	29.37	37.52	42.60	PRE-1
2	SCS Runoff	------	2.90	4.04	-------	8.93	13.24	17.92	22.89	25.99	PRE-2
3	SCS Runoff	------	0.50	0.69	-------	1.54	2.26	3.04	3.86	4.37	PRE-3
4	SCS Runoff	------	3.36	4.62	-------	10.38	15.21	20.43	25.95	29.39	PRE-4
5	SCS Runoff	------	0.30	0.68	-------	2.42	4.05	6.07	8.26	9.66	PRE-5
6	SCS Runoff	------	0.65	1.09	-------	4.26	7.68	11.89	16.72	19.86	PRE-1 OFFSITE
7	SCS Runoff	------	0.01	0.01	-------	0.09	0.24	0.44	0.69	0.87	PRE-2 OFFSITE
8	Combine	1, 6,	4.86	6.87	-------	16.50	24.97	34.59	45.20	51.96	PRE 1 TOTAL
9	Combine	2, 7,	2.90	4.04	-------	8.97	13.34	18.13	23.26	26.47	PRE 2 TOTAL
10	Combine	5, 9	3.20	4.61	-------	11.37	17.32	23.84	30.84	35.23	Pre 1 & 5 Total
11	Combine	3, 4,	3.86	5.31	-------	11.92	17.47	23.46	29.82	33.77	PARK TOTAL
12	Combine	8, 10,	8.06	11.48	-------	27.27	41.68	57.76	75.28	86.39	TOTAL AT ENT
13	Combine	11, 12	11.16	16.12	-------	38.40	57.50	78.61	101.43	115.82	Total Site

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	4.75	5	730	25,352	----	------	------	PRE-1
2	SCS Runoff	2.90	5	730	15,467	----	------	------	PRE-2
3	SCS Runoff	0.50	5	725	1,962	----	------	------	PRE-3
4	SCS Runoff	3.36	5	725	13,192	----	------	------	PRE-4
5	SCS Runoff	0.30	5	730	2,894	----	------	------	PRE-5
6	SCS Runoff	0.65	5	785	13,056	----	------	------	PRE-1 OFFSITE
7	SCS Runoff	0.01	5	935	219	----	------	------	PRE-2 OFFSITE
8	Combine	4.86	5	730	38,408	1, 6,	------	------	PRE 1 TOTAL
9	Combine	2.90	5	730	15,686	2, 7,	------	------	PRE 2 TOTAL
10	Combine	3.20	5	730	18,580	5, 9	------	------	Pre 1 & 5 Total
11	Combine	3.86	5	725	15,155	3, 4,	------	------	PARK TOTAL
12	Combine	8.06	5	730	56,988	8, 10,	------	------	TOTAL AT ENT
13	Combine	11.16	5	725	72,142	11, 12	------	------	Total Site

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

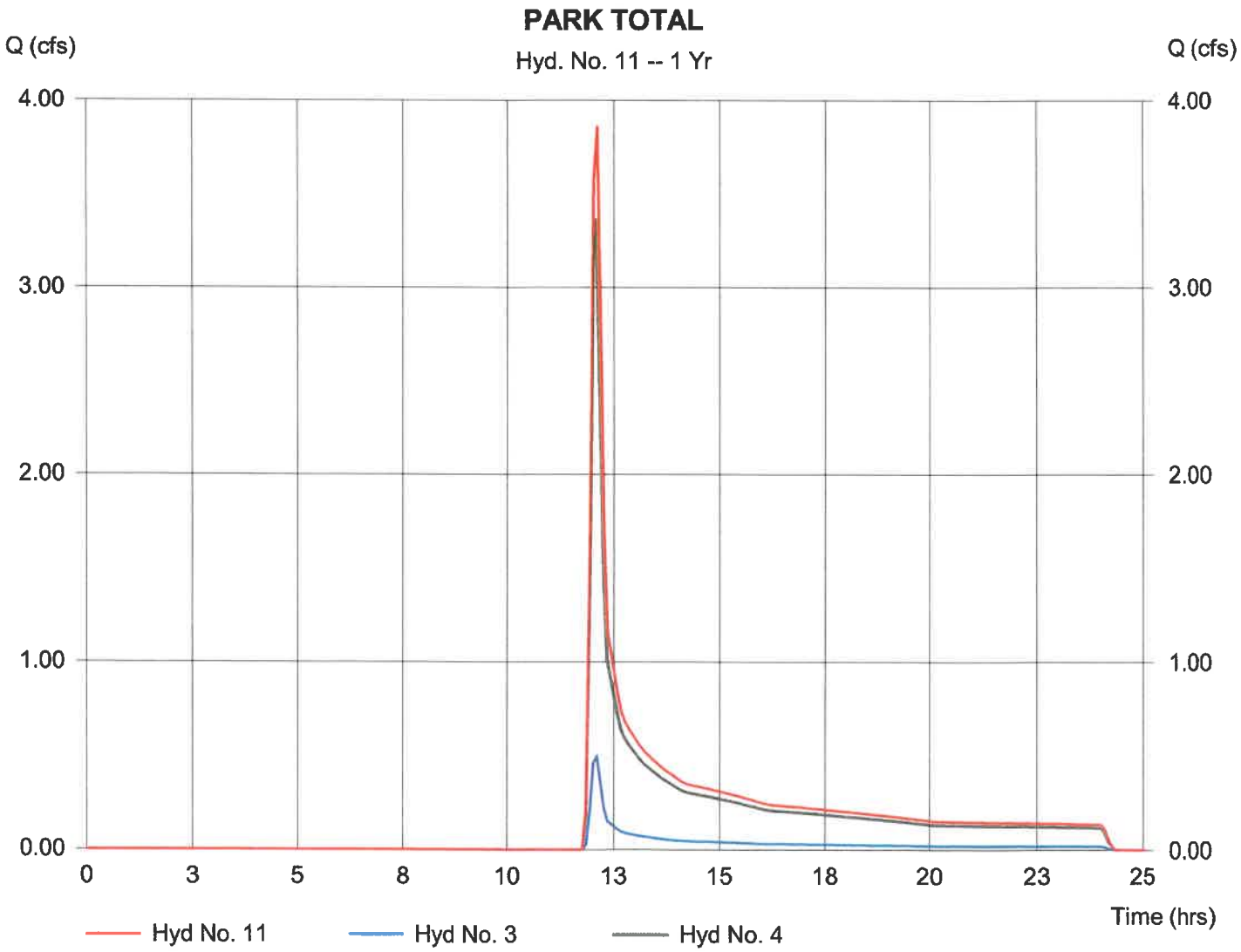
Tuesday, Dec 3 2019, 10:38 PM

Hyd. No. 11

PARK TOTAL

Hydrograph type	= Combine	Peak discharge	= 3.86 cfs
Storm frequency	= 1 yrs	Time interval	= 5 min
Inflow hyds.	= 3, 4		

Hydrograph Volume = 15,155 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

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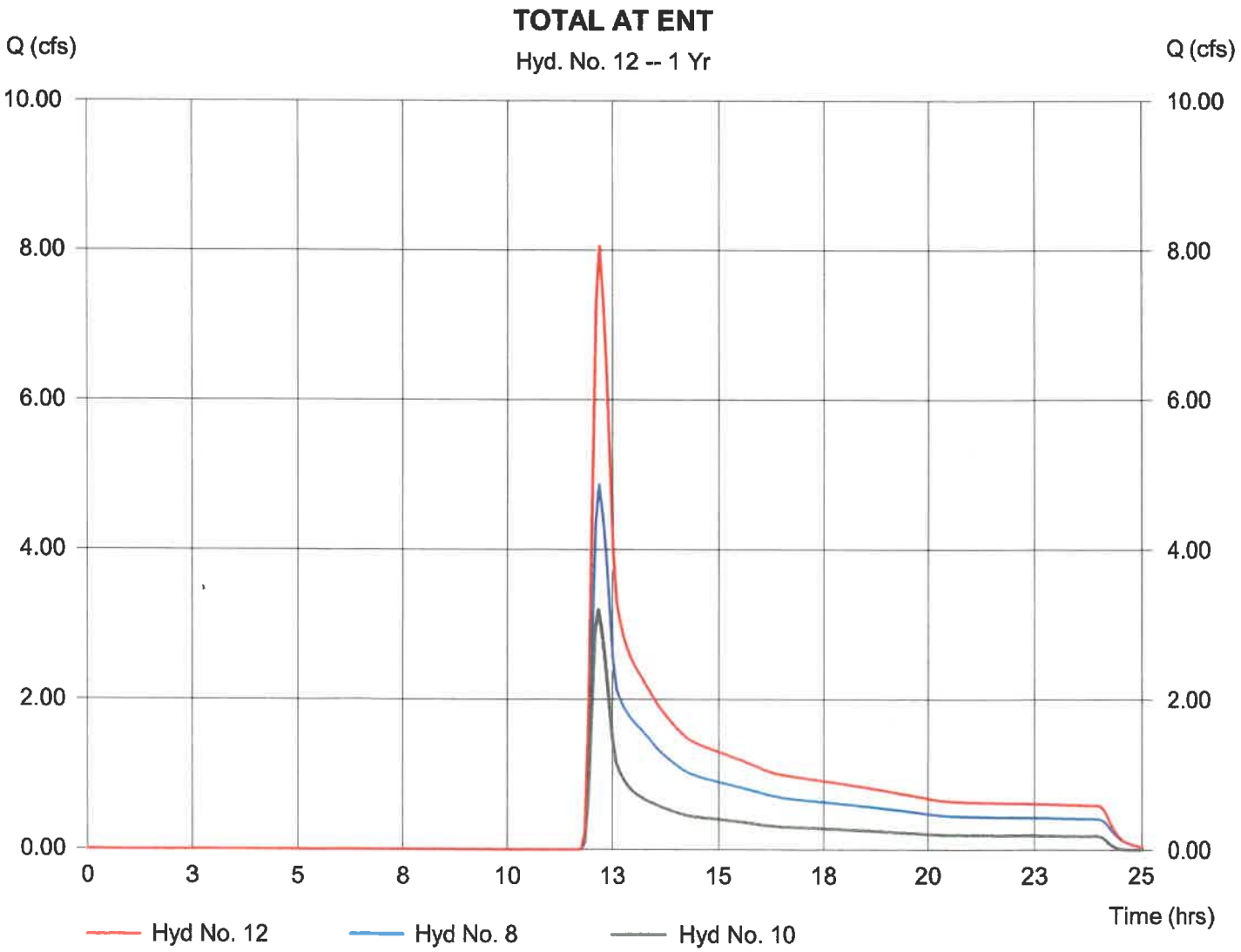
Hyd. No. 12

TOTAL AT ENT

Hydrograph type	= Combine	Peak discharge	= 8.06 cfs
Storm frequency	= 1 yrs	Time interval	= 5 min
Inflow hyds.	= 8, 10		

Hydrograph Volume = 56,988 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

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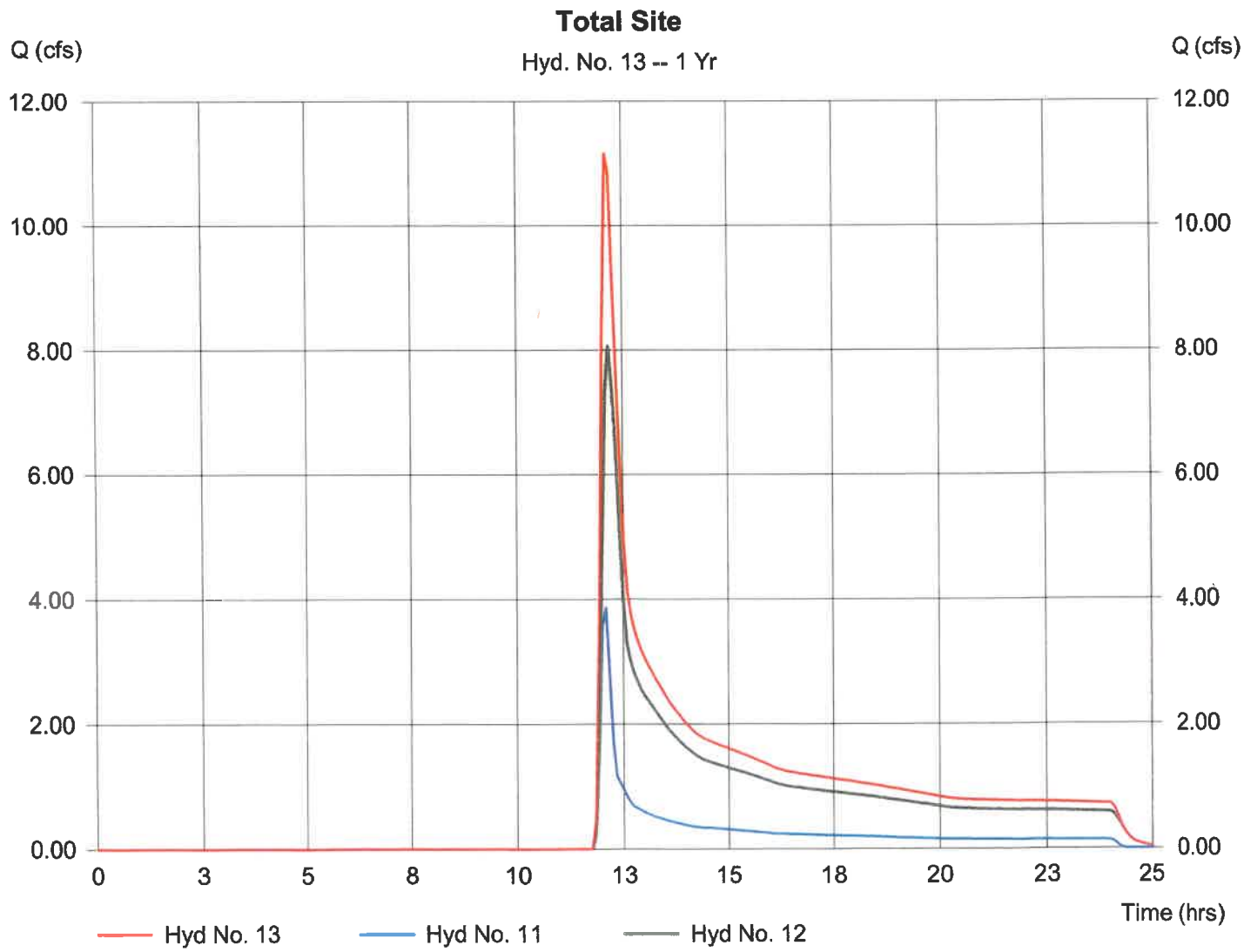
Hyd. No. 13

Total Site

Hydrograph type = Combine
Storm frequency = 1 yrs
Inflow hyds. = 11, 12

Peak discharge = 11.16 cfs
Time interval = 5 min

Hydrograph Volume = 72,142 cuft



Hydrograph Summary Report

d. .o.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	6.62	5	730	32,270	----	------	------	PRE-1
2	SCS Runoff	4.04	5	730	19,688	----	------	------	PRE-2
3	SCS Runoff	0.69	5	725	2,498	----	------	------	PRE-3
4	SCS Runoff	4.62	5	725	16,792	----	------	------	PRE-4
5	SCS Runoff	0.68	5	725	4,095	----	------	------	PRE-5
6	SCS Runoff	1.09	5	775	18,446	----	------	------	PRE-1 OFFSITE
7	SCS Runoff	0.01	5	820	392	----	------	------	PRE-2 OFFSITE
8	Combine	6.87	5	730	50,716	1, 6,	------	------	PRE 1 TOTAL
9	Combine	4.04	5	730	20,080	2, 7,	------	------	PRE 2 TOTAL
10	Combine	4.61	5	730	24,175	5, 9	------	------	Pre 1 & 5 Total
11	Combine	5.31	5	725	19,290	3, 4,	------	------	PARK TOTAL
12	Combine	11.48	5	730	74,891	8, 10,	------	------	TOTAL AT ENT
13	Combine	16.12	5	725	94,181	11, 12	------	------	Total Site

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

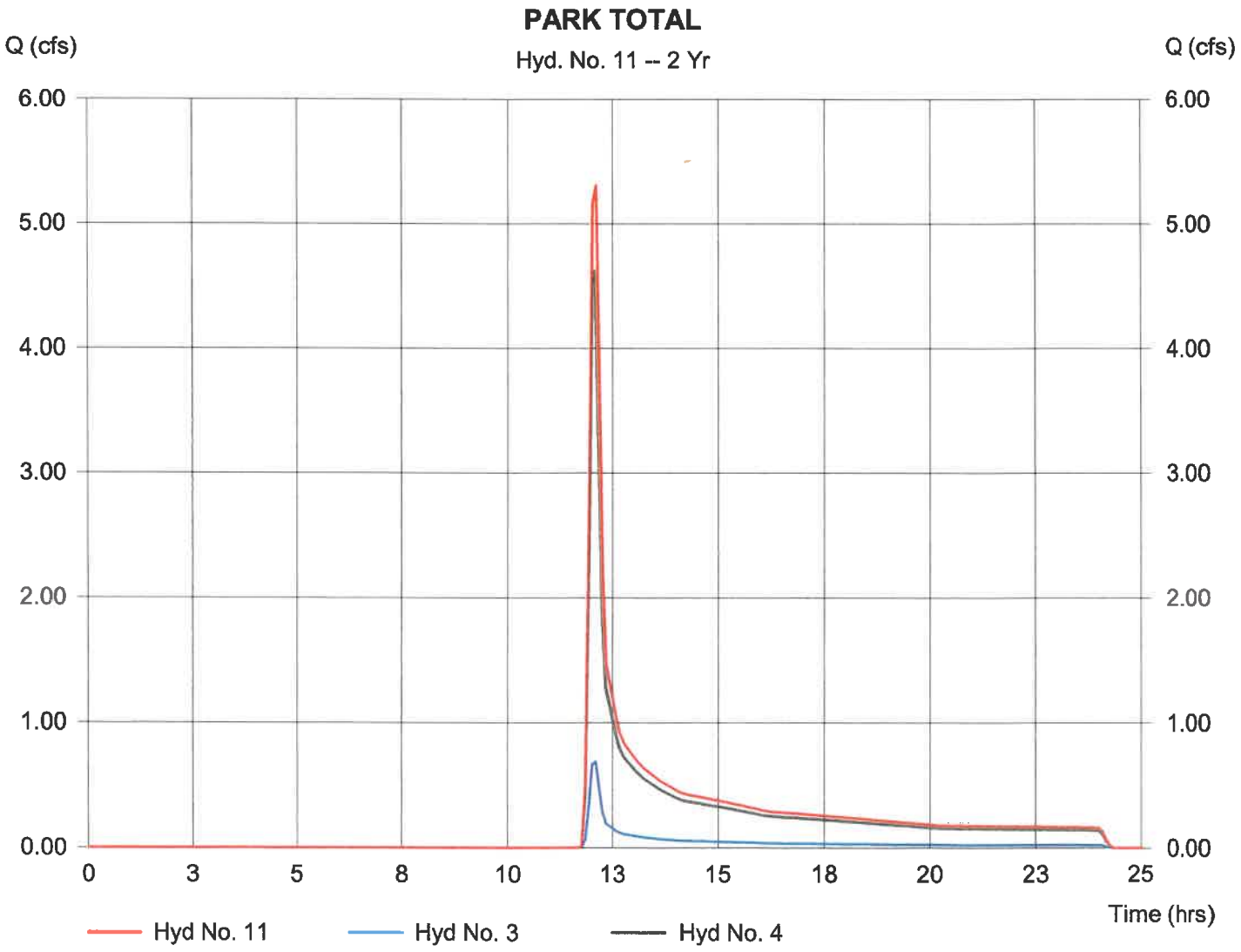
Tuesday, Dec 3 2019, 10:38 PM

Hyd. No. 11

PARK TOTAL

Hydrograph type	= Combine	Peak discharge	= 5.31 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Inflow hyds.	= 3, 4		

Hydrograph Volume = 19,290 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

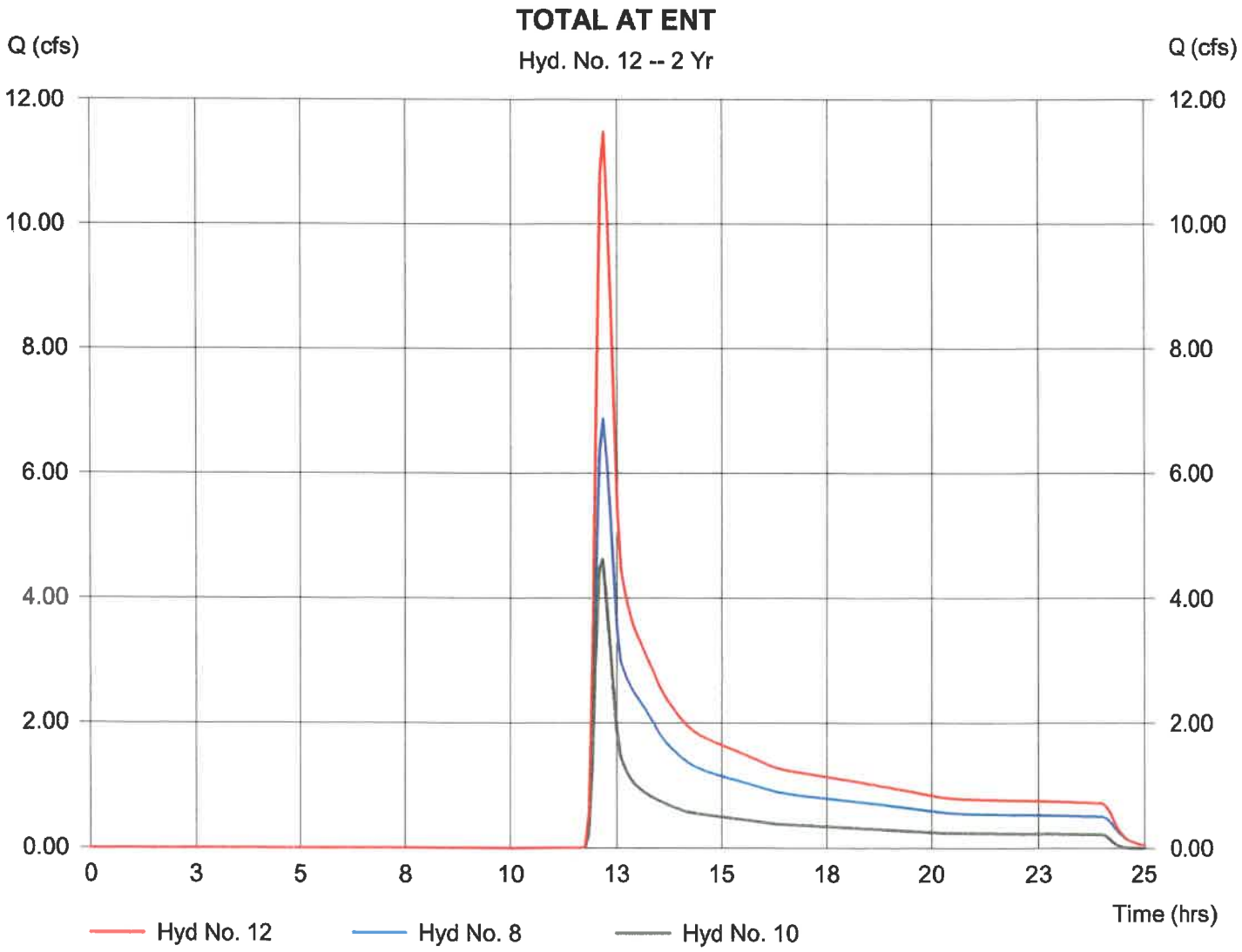
Tuesday, Dec 3 2019, 10:38 PM

Hyd. No. 12

TOTAL AT ENT

Hydrograph type	= Combine	Peak discharge	= 11.48 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Inflow hyds.	= 8, 10		

Hydrograph Volume = 74,891 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

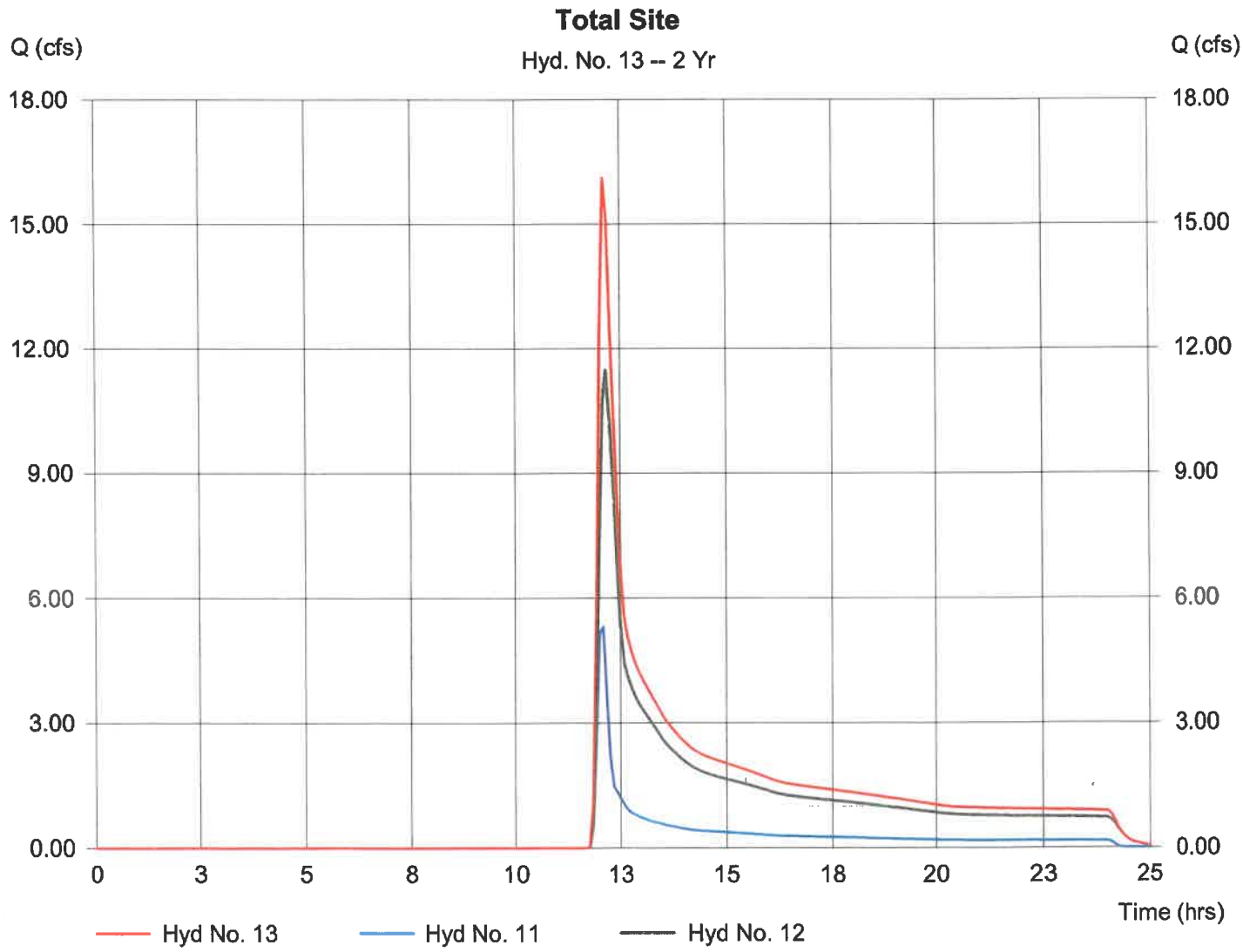
Tuesday, Dec 3 2019, 10:38 PM

Hyd. No. 13

Total Site

Hydrograph type	= Combine	Peak discharge	= 16.12 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Inflow hyds.	= 11, 12		

Hydrograph Volume = 94,181 cuft



Hydrograph Summary Report

d. .o.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	14.63	5	730	60,973	----	------	------	PRE-1
2	SCS Runoff	8.93	5	730	37,199	----	------	------	PRE-2
3	SCS Runoff	1.54	5	720	4,720	----	------	------	PRE-3
4	SCS Runoff	10.38	5	720	31,727	----	------	------	PRE-4
5	SCS Runoff	2.42	5	725	9,219	----	------	------	PRE-5
6	SCS Runoff	4.26	5	755	45,395	----	------	------	PRE-1 OFFSITE
7	SCS Runoff	0.09	5	755	1,311	----	------	------	PRE-2 OFFSITE
8	Combine	16.50	5	730	106,367	1, 6,	------	------	PRE 1 TOTAL
9	Combine	8.97	5	730	38,510	2, 7,	------	------	PRE 2 TOTAL
10	Combine	11.37	5	725	47,729	5, 9	------	------	Pre 1 & 5 Total
11	Combine	11.92	5	720	36,447	3, 4,	------	------	PARK TOTAL
12	Combine	27.27	5	725	154,097	8, 10,	------	------	TOTAL AT ENT
13	Combine	38.40	5	725	190,544	11, 12	------	------	Total Site

Hydrograph Summary Report

d. .o.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	21.70	5	725	84,701	----	------	------	PRE-1
2	SCS Runoff	13.24	5	725	51,676	----	------	------	PRE-2
3	SCS Runoff	2.26	5	720	6,557	----	------	------	PRE-3
4	SCS Runoff	15.21	5	720	44,075	----	------	------	PRE-4
5	SCS Runoff	4.05	5	720	13,747	----	------	------	PRE-5
6	SCS Runoff	7.68	5	750	69,594	----	------	------	PRE-1 OFFSITE
7	SCS Runoff	0.24	5	745	2,285	----	------	------	PRE-2 OFFSITE
8	Combine	24.97	5	730	154,295	1, 6,	------	------	PRE 1 TOTAL
9	Combine	13.34	5	725	53,960	2, 7,	------	------	PRE 2 TOTAL
10	Combine	17.32	5	725	67,707	5, 9	------	------	Pre 1 & 5 Total
11	Combine	17.47	5	720	50,631	3, 4,	------	------	PARK TOTAL
12	Combine	41.68	5	725	222,002	8, 10,	------	------	TOTAL AT ENT
13	Combine	57.50	5	725	272,633	11, 12	------	------	Total Site

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

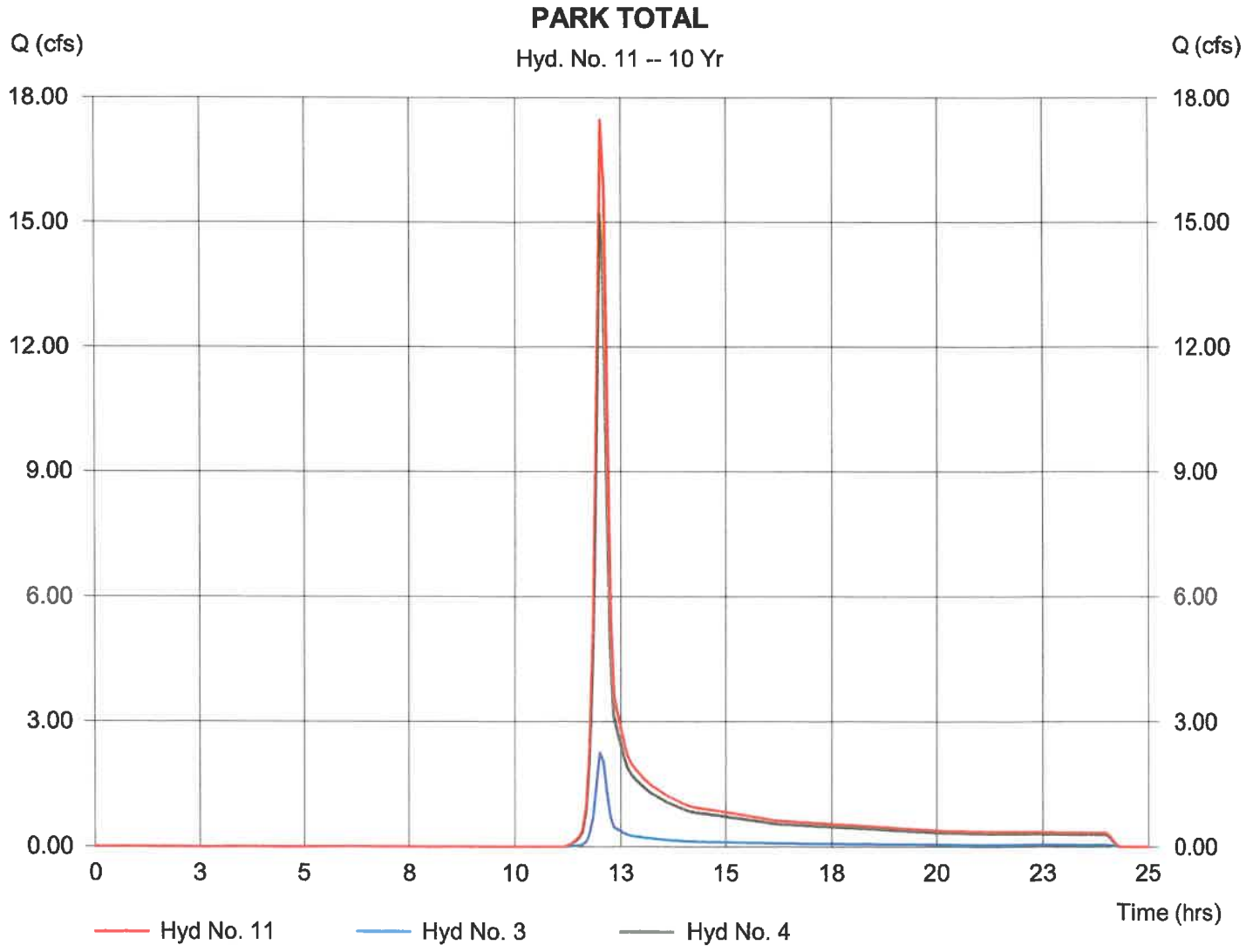
Tuesday, Dec 3 2019, 10:38 PM

Hyd. No. 11

PARK TOTAL

Hydrograph type	= Combine	Peak discharge	= 17.47 cfs
Storm frequency	= 10 yrs	Time interval	= 5 min
Inflow hyds.	= 3, 4		

Hydrograph Volume = 50,631 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

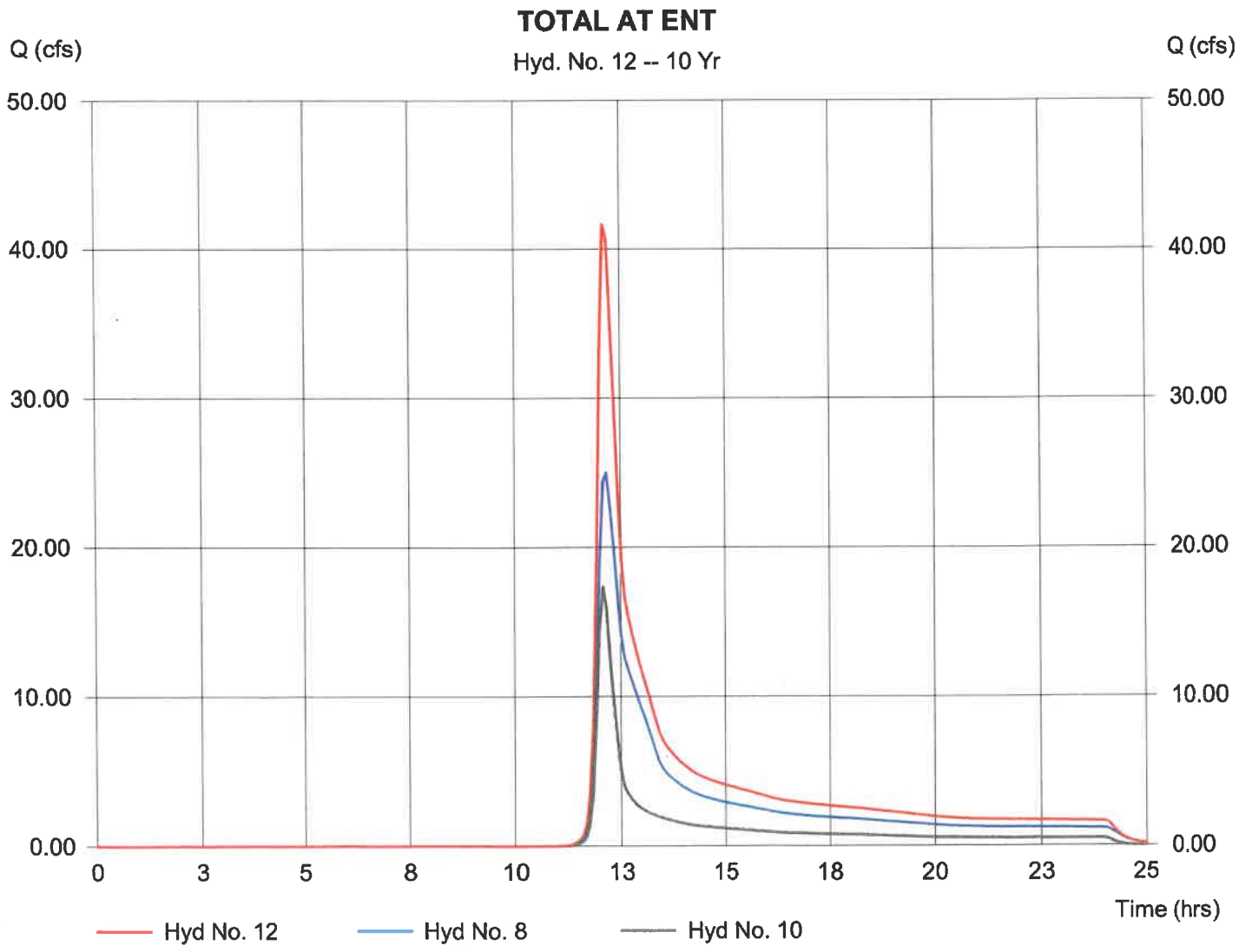
Tuesday, Dec 3 2019, 10:38 PM

Hyd. No. 12

TOTAL AT ENT

Hydrograph type	= Combine	Peak discharge	= 41.68 cfs
Storm frequency	= 10 yrs	Time interval	= 5 min
Inflow hyds.	= 8, 10		

Hydrograph Volume = 222,002 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

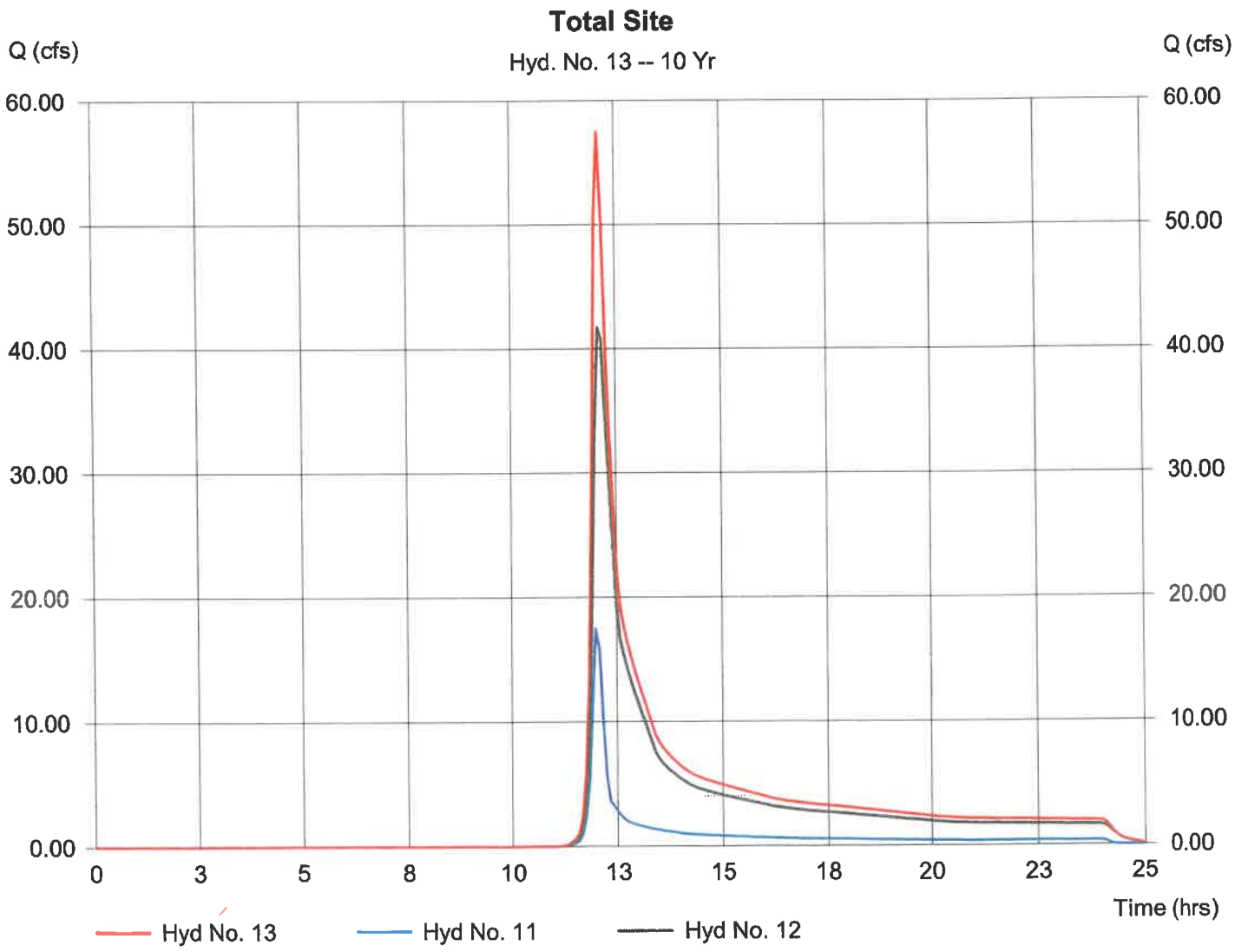
Tuesday, Dec 3 2019, 10:38 PM

Hyd. No. 13

Total Site

Hydrograph type	= Combine	Peak discharge	= 57.50 cfs
Storm frequency	= 10 yrs	Time interval	= 5 min
Inflow hyds.	= 11, 12		

Hydrograph Volume = 272,633 cuft



Hydrograph Summary Report

d. .o.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	29.37	5	725	110,537	----	------	------	PRE-1
2	SCS Runoff	17.92	5	725	67,437	----	------	------	PRE-2
3	SCS Runoff	3.04	5	720	8,556	----	------	------	PRE-3
4	SCS Runoff	20.43	5	720	57,518	----	------	------	PRE-4
5	SCS Runoff	6.07	5	720	18,867	----	------	------	PRE-5
6	SCS Runoff	11.89	5	750	97,311	----	------	------	PRE-1 OFFSITE
7	SCS Runoff	0.44	5	740	3,429	----	------	------	PRE-2 OFFSITE
8	Combine	34.59	5	730	207,847	1, 6,	------	------	PRE 1 TOTAL
9	Combine	18.13	5	725	70,866	2, 7,	------	------	PRE 2 TOTAL
10	Combine	23.84	5	725	89,733	5, 9	------	------	Pre 1 & 5 Total
11	Combine	23.46	5	720	66,075	3, 4,	------	------	PARK TOTAL
12	Combine	57.76	5	725	297,580	8, 10,	------	------	TOTAL AT ENT
13	Combine	78.61	5	725	363,655	11, 12	------	------	Total Site

Hydrograph Summary Report

d. .o.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	37.52	5	725	138,079	----	------	------	PRE-1
2	SCS Runoff	22.89	5	725	84,241	----	------	------	PRE-2
3	SCS Runoff	3.86	5	720	10,688	----	------	------	PRE-3
4	SCS Runoff	25.95	5	720	71,850	----	------	------	PRE-4
5	SCS Runoff	8.26	5	720	24,477	----	------	------	PRE-5
6	SCS Runoff	16.72	5	750	127,954	----	------	------	PRE-1 OFFSITE
7	SCS Runoff	0.69	5	740	4,735	----	------	------	PRE-2 OFFSITE
8	Combine	45.20	5	730	266,033	1, 6,	------	------	PRE 1 TOTAL
9	Combine	23.26	5	725	88,976	2, 7,	------	------	PRE 2 TOTAL
10	Combine	30.84	5	725	113,454	5, 9	------	------	Pre 1 & 5 Total
11	Combine	29.82	5	720	82,539	3, 4,	------	------	PARK TOTAL
12	Combine	75.28	5	725	379,487	8, 10,	------	------	TOTAL AT ENT
13	Combine	101.43	5	725	462,025	11, 12	------	------	Total Site

Hydrograph Summary Report

d. .o.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	42.60	5	725	155,299	----	------	------	PRE-1
2	SCS Runoff	25.99	5	725	94,747	----	------	------	PRE-2
3	SCS Runoff	4.37	5	720	12,021	----	------	------	PRE-3
4	SCS Runoff	29.39	5	720	80,811	----	------	------	PRE-4
5	SCS Runoff	9.66	5	720	28,048	----	------	------	PRE-5
6	SCS Runoff	19.86	5	750	147,561	----	------	------	PRE-1 OFFSITE
7	SCS Runoff	0.87	5	740	5,599	----	------	------	PRE-2 OFFSITE
8	Combine	51.96	5	730	302,860	1, 6,	------	------	PRE 1 TOTAL
9	Combine	26.47	5	725	100,346	2, 7,	------	------	PRE 2 TOTAL
10	Combine	35.23	5	725	128,394	5, 9	------	------	Pre 1 & 5 Total
11	Combine	33.77	5	720	92,832	3, 4,	------	------	PARK TOTAL
12	Combine	86.39	5	725	431,254	8, 10,	------	------	TOTAL AT ENT
13	Combine	115.82	5	725	524,086	11, 12	------	------	Total Site

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

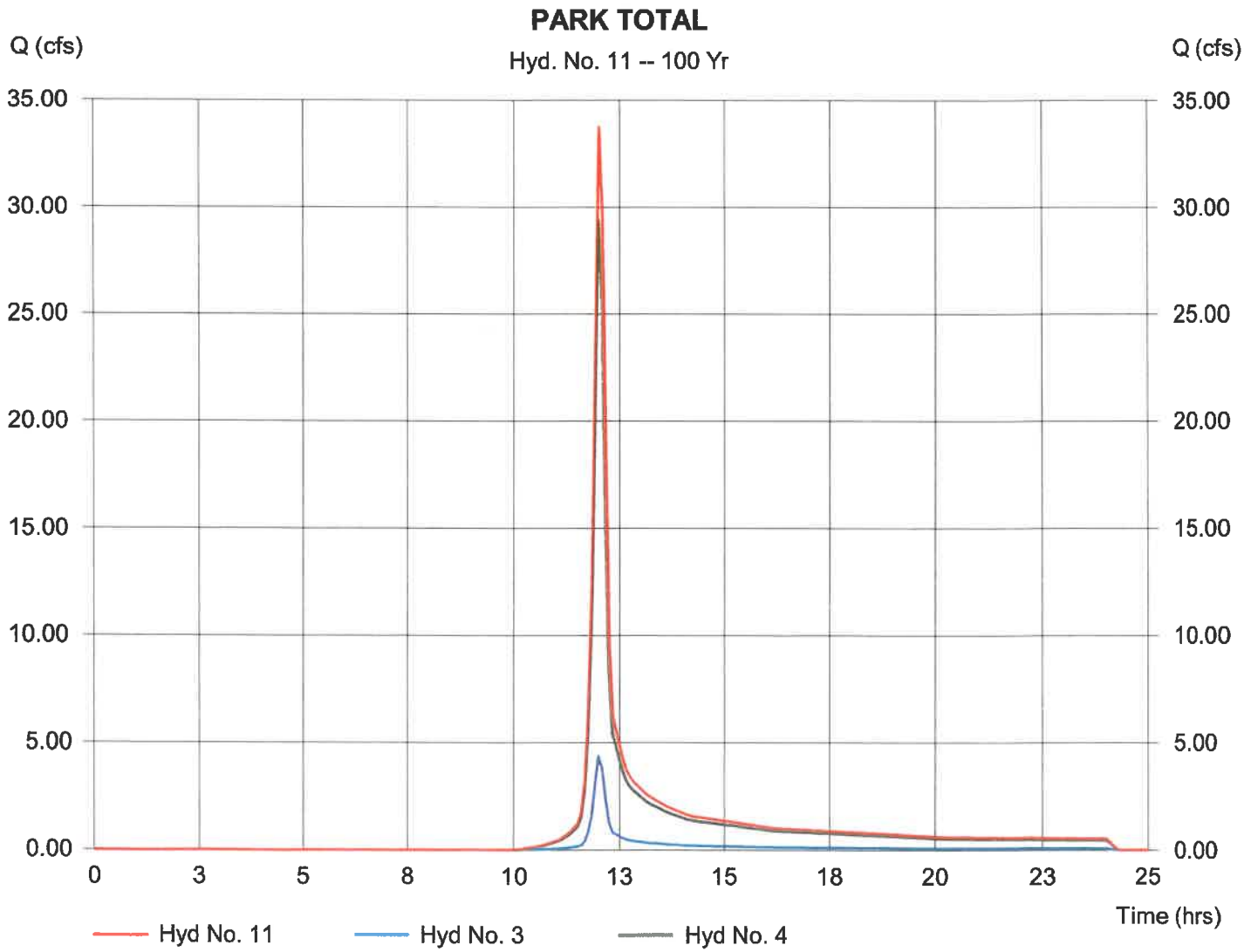
Tuesday, Dec 3 2019, 10:38 PM

Hyd. No. 11

PARK TOTAL

Hydrograph type	= Combine	Peak discharge	= 33.77 cfs
Storm frequency	= 100 yrs	Time interval	= 5 min
Inflow hyds.	= 3, 4		

Hydrograph Volume = 92,832 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

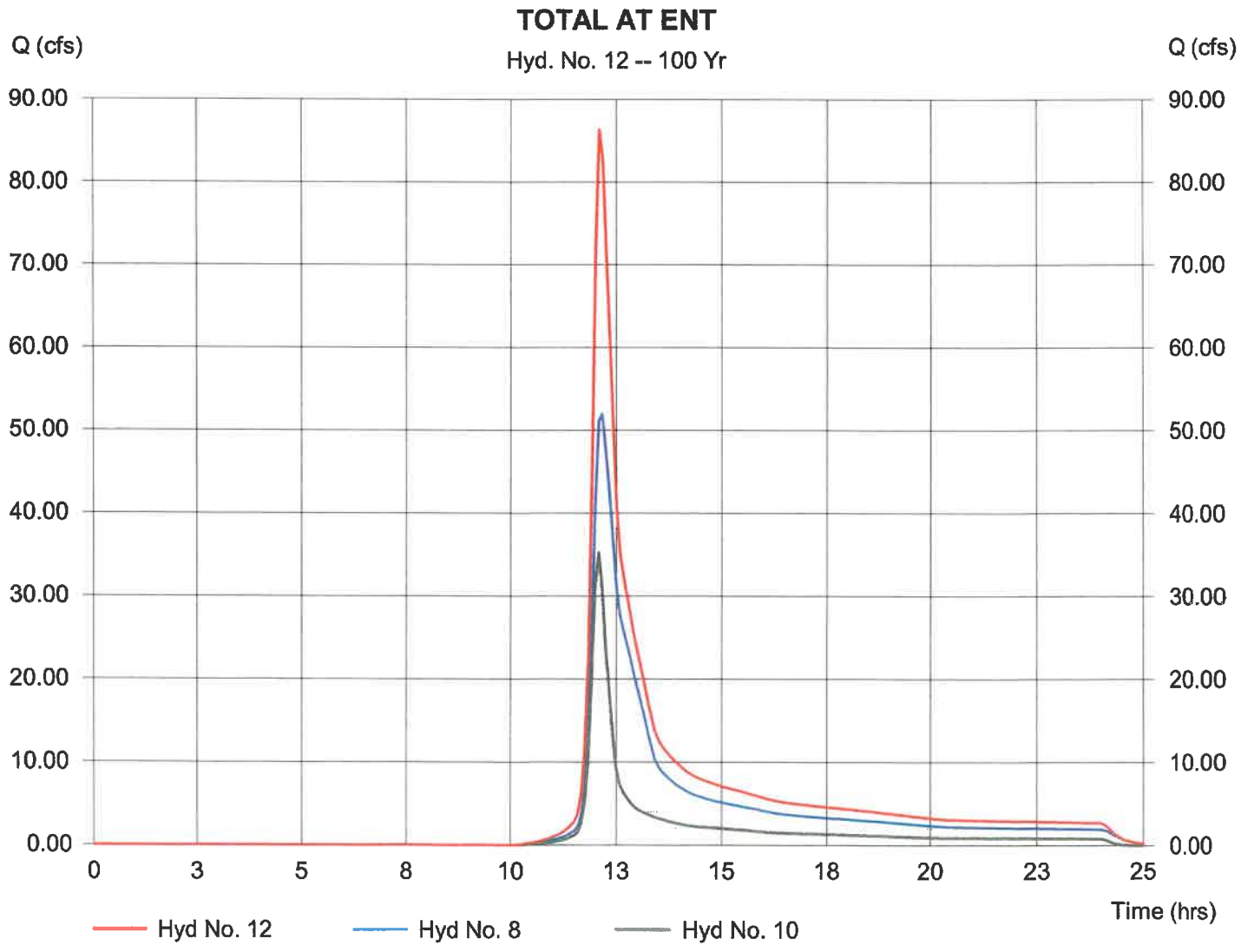
Tuesday, Dec 3 2019, 10:38 PM

Hyd. No. 12

TOTAL AT ENT

Hydrograph type	= Combine	Peak discharge	= 86.39 cfs
Storm frequency	= 100 yrs	Time interval	= 5 min
Inflow hyds.	= 8, 10		

Hydrograph Volume = 431,254 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

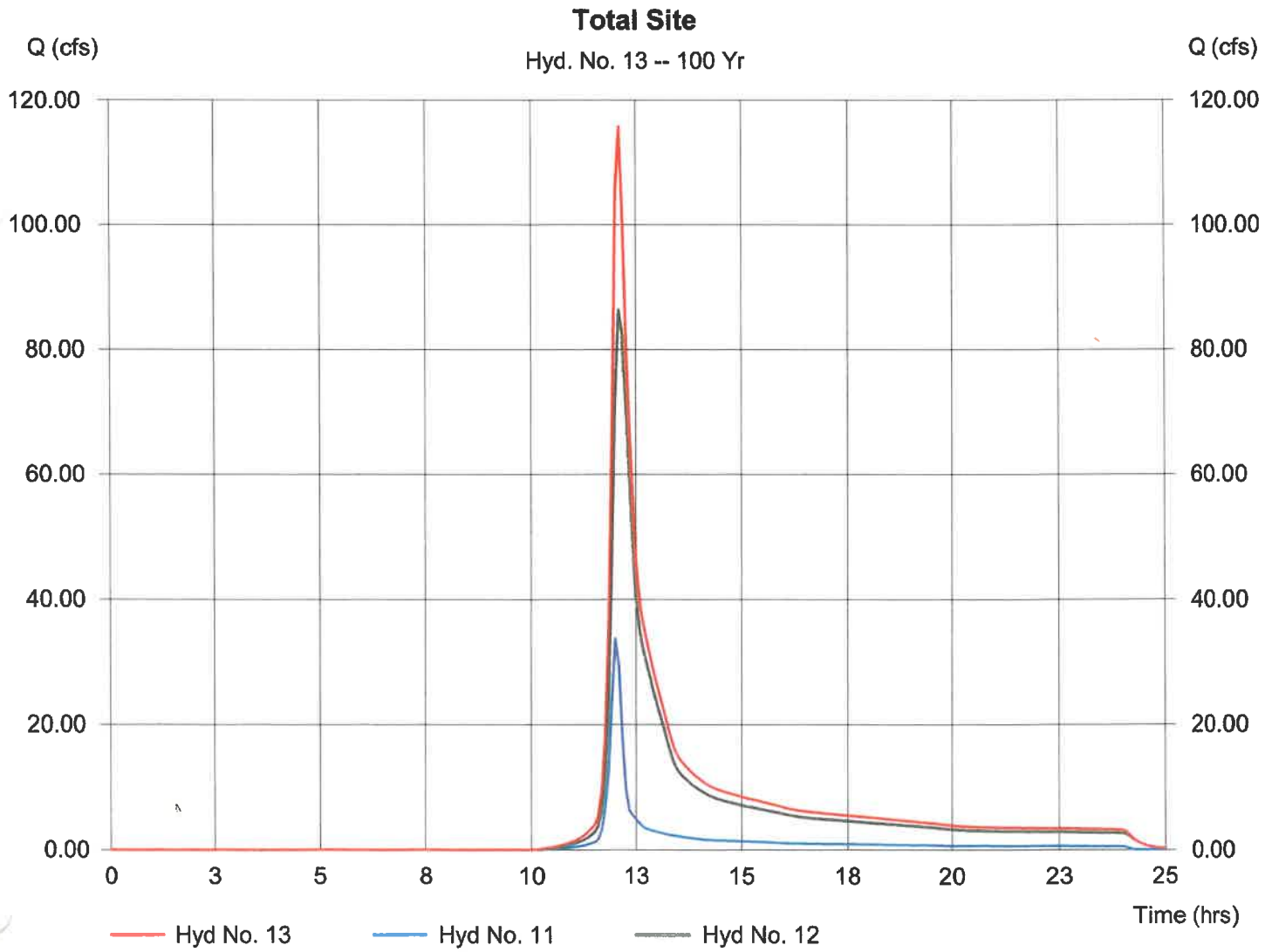
Tuesday, Dec 3 2019, 10:38 PM

Hyd. No. 13

Total Site

Hydrograph type	= Combine	Peak discharge	= 115.82 cfs
Storm frequency	= 100 yrs	Time interval	= 5 min
Inflow hyds.	= 11, 12		

Hydrograph Volume = 524,086 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

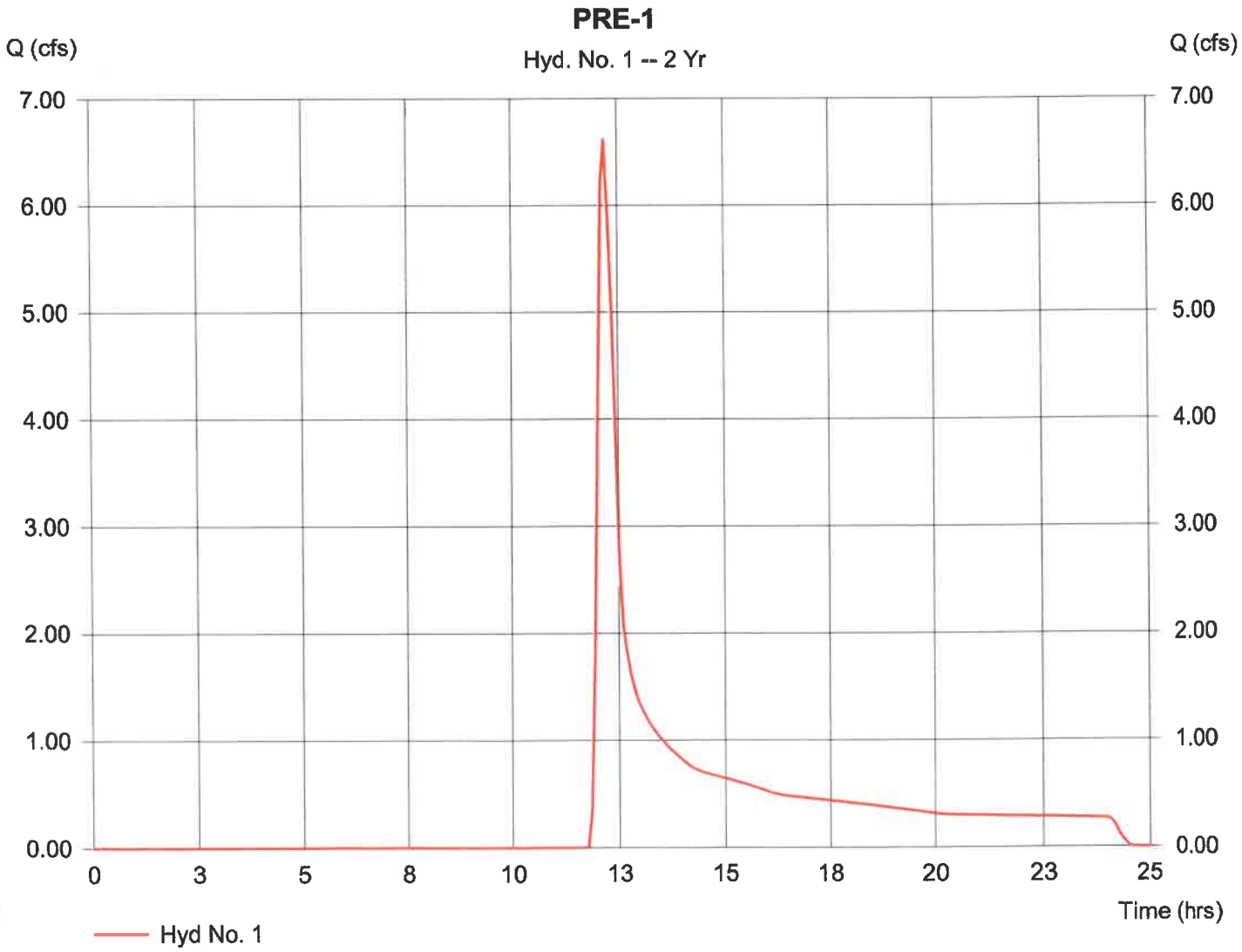
Wednesday, Oct 23 2019, 11:48 AM

Hyd. No. 1

PRE-1

Hydrograph type	= SCS Runoff	Peak discharge	= 6.62 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Drainage area	= 21.80 ac	Curve number	= 70
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 18.7 min
Total precip.	= 2.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 32,270 cuft



TR55 Tc Worksheet

Hydraflow Hydrographs by Intelisolve

Hyd. No. 1

PRE-1

Description	A	B	C	Totals
Sheet Flow				
Manning's n-value	= 0.030	0.011	0.011	
Flow length (ft)	= 100.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 2.40	0.00	0.00	
Land slope (%)	= 2.00	0.00	0.00	
Travel Time (min)	**= 3.12 +**	**0.00 +**	**0.00 =**	**3.12**
Shallow Concentrated Flow				
Flow length (ft)	= 200.00	0.00	0.00	
Watercourse slope (%)	= 0.75	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	= 1.40	0.00	0.00	
Travel Time (min)	**= 2.39 +**	**0.00 +**	**0.00 =**	**2.39**
Channel Flow				
X sectional flow area (sqft)	= 10.00	0.00	0.00	
Wetted perimeter (ft)	= 20.00	0.00	0.00	
Channel slope (%)	= 0.70	0.00	0.00	
Manning's n-value	= 0.035	0.015	0.015	
Velocity (ft/s)	= 2.24	0.00	0.00	
Flow length (ft)	= 1770.0	0.0	0.0	
Travel Time (min)	**= 13.18 +**	**0.00 +**	**0.00 =**	**13.18**

Total Travel Time, Tc ..... 18.70 min

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

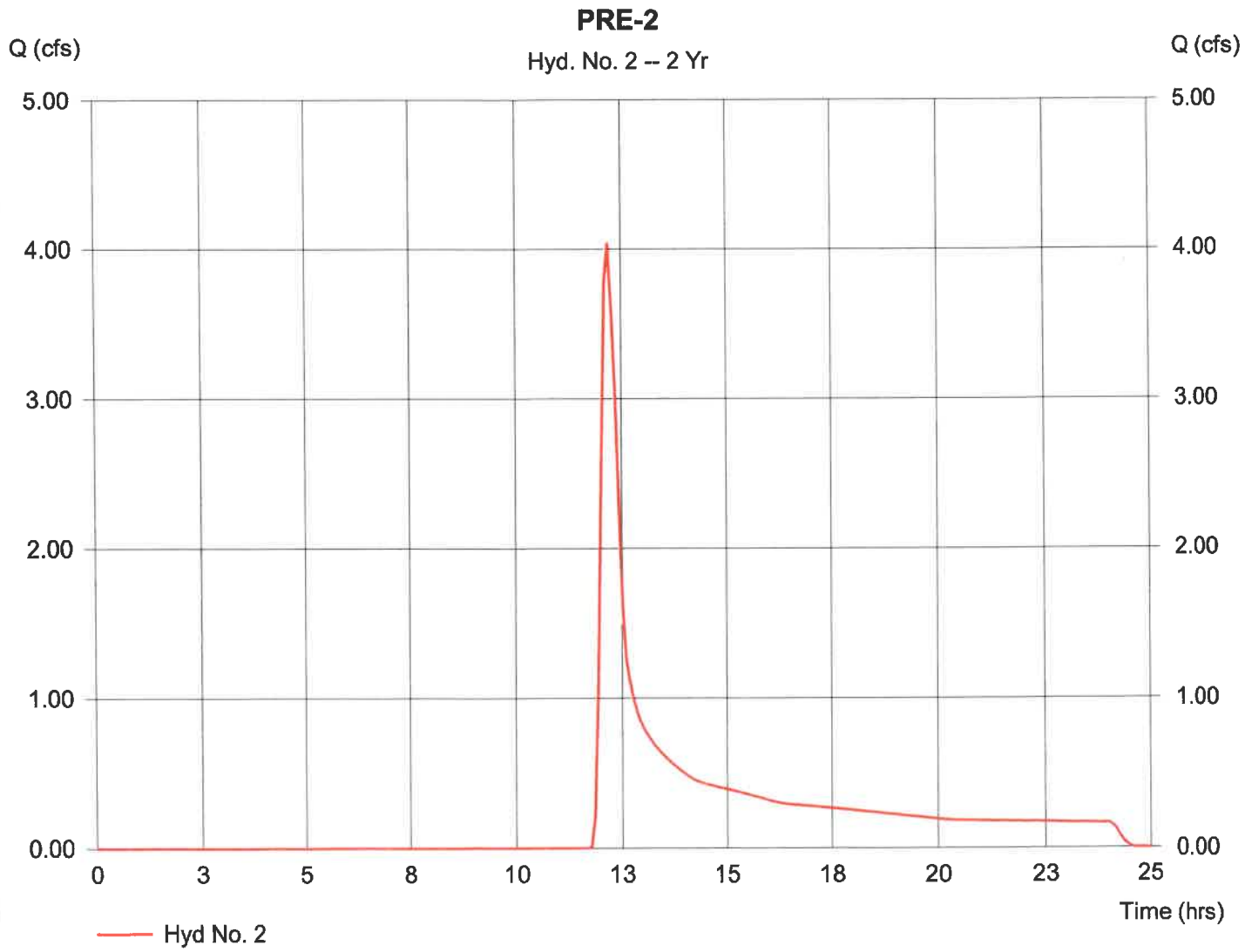
Wednesday, Oct 23 2019, 11:11 AM

Hyd. No. 2

PRE-2

Hydrograph type	= SCS Runoff	Peak discharge	= 4.04 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Drainage area	= 13.30 ac	Curve number	= 70
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 16.3 min
Total precip.	= 2.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 19,688 cuft



TR55 Tc Worksheet

Hydraflow Hydrographs by Intelisolve

Hyd. No. 2

PRE-2

Description	A	B	C	Totals
Sheet Flow				
Manning's n-value	= 0.020	0.011	0.011	
Flow length (ft)	= 200.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 2.40	0.00	0.00	
Land slope (%)	= 0.25	0.00	0.00	
Travel Time (min)	**= 9.03**	**+ 0.00**	**+ 0.00**	**= 9.03**
Shallow Concentrated Flow				
Flow length (ft)	= 400.00	0.00	0.00	
Watercourse slope (%)	= 0.85	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	= 1.49	0.00	0.00	
Travel Time (min)	**= 4.48**	**+ 0.00**	**+ 0.00**	**= 4.48**
Channel Flow				
X sectional flow area (sqft)	= 10.00	0.00	0.00	
Wetted perimeter (ft)	= 20.00	0.00	0.00	
Channel slope (%)	= 0.69	0.00	0.00	
Manning's n-value	= 0.035	0.015	0.015	
Velocity (ft/s)	= 2.22	0.00	0.00	
Flow length (ft)	= 375.0	0.0	0.0	
Travel Time (min)	**= 2.81**	**+ 0.00**	**+ 0.00**	**= 2.81**

Total Travel Time, Tc ..... 16.30 min

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

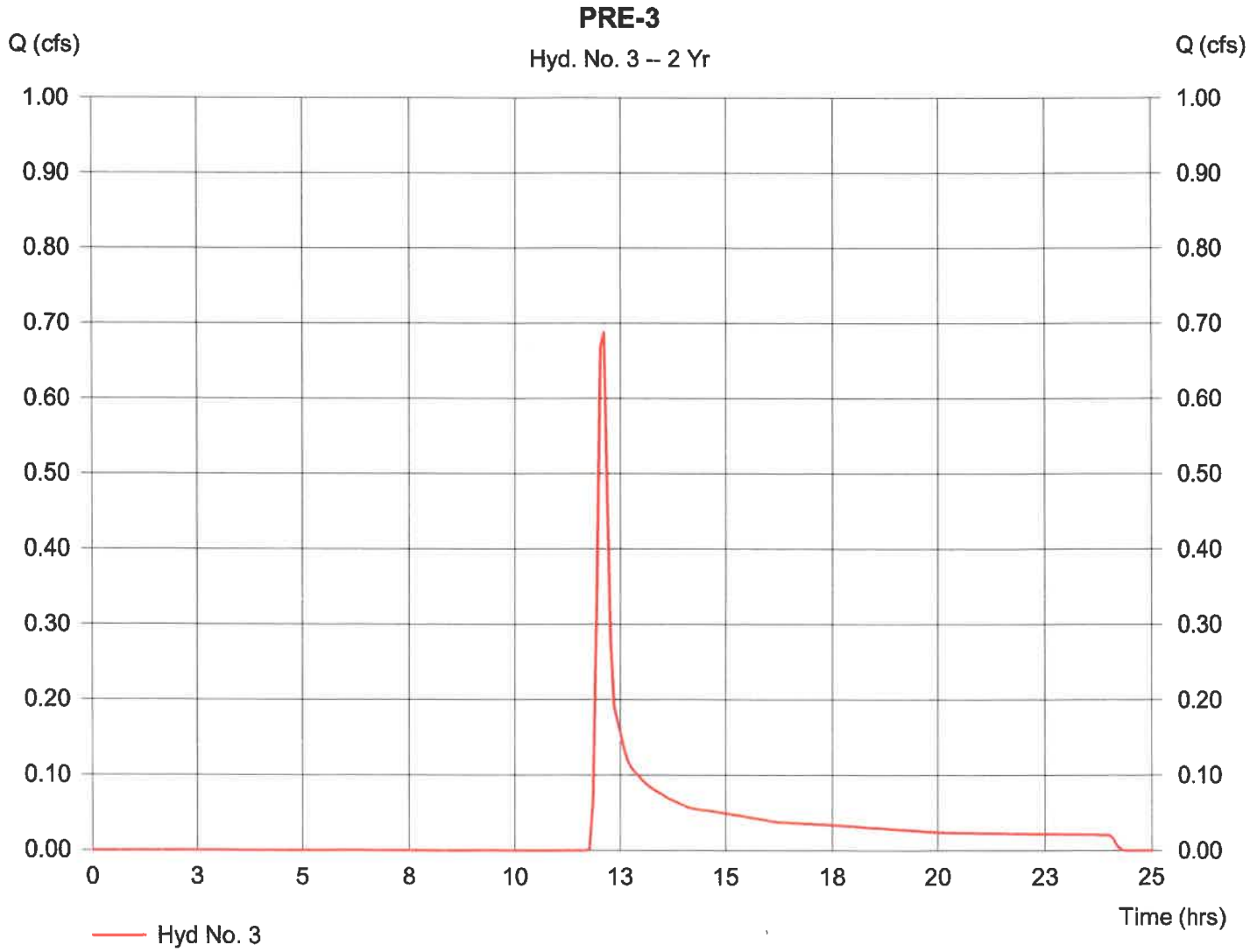
Wednesday, Oct 23 2019, 11:11 AM

Hyd. No. 3

PRE-3

Hydrograph type	= SCS Runoff	Peak discharge	= 0.69 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Drainage area	= 1.80 ac	Curve number	= 70
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 9 min
Total precip.	= 2.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 2,498 cuft



TR55 Tc Worksheet

Hydraflow Hydrographs by Intelisolve

Hyd. No. 3

PRE-3

Description	A	B	C	Totals
Sheet Flow				
Manning's n-value	= 0.020	0.011	0.011	
Flow length (ft)	= 200.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 2.40	0.00	0.00	
Land slope (%)	= 1.00	0.00	0.00	
Travel Time (min)	**= 5.19**	**+ 0.00**	**+ 0.00**	**= 5.19**
Shallow Concentrated Flow				
Flow length (ft)	= 450.00	0.00	0.00	
Watercourse slope (%)	= 1.50	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	= 1.98	0.00	0.00	
Travel Time (min)	**= 3.80**	**+ 0.00**	**+ 0.00**	**= 3.80**
Channel Flow				
X sectional flow area (sqft)	= 0.00	0.00	0.00	
Wetted perimeter (ft)	= 0.00	0.00	0.00	
Channel slope (%)	= 0.00	0.00	0.00	
Manning's n-value	= 0.015	0.015	0.015	
Velocity (ft/s)	= 0.00	0.00	0.00	
Flow length (ft)	= 0.0	0.0	0.0	
Travel Time (min)	**= 0.00**	**+ 0.00**	**+ 0.00**	**= 0.00**

Total Travel Time, Tc ..... 9.00 min

Hydrograph Plot

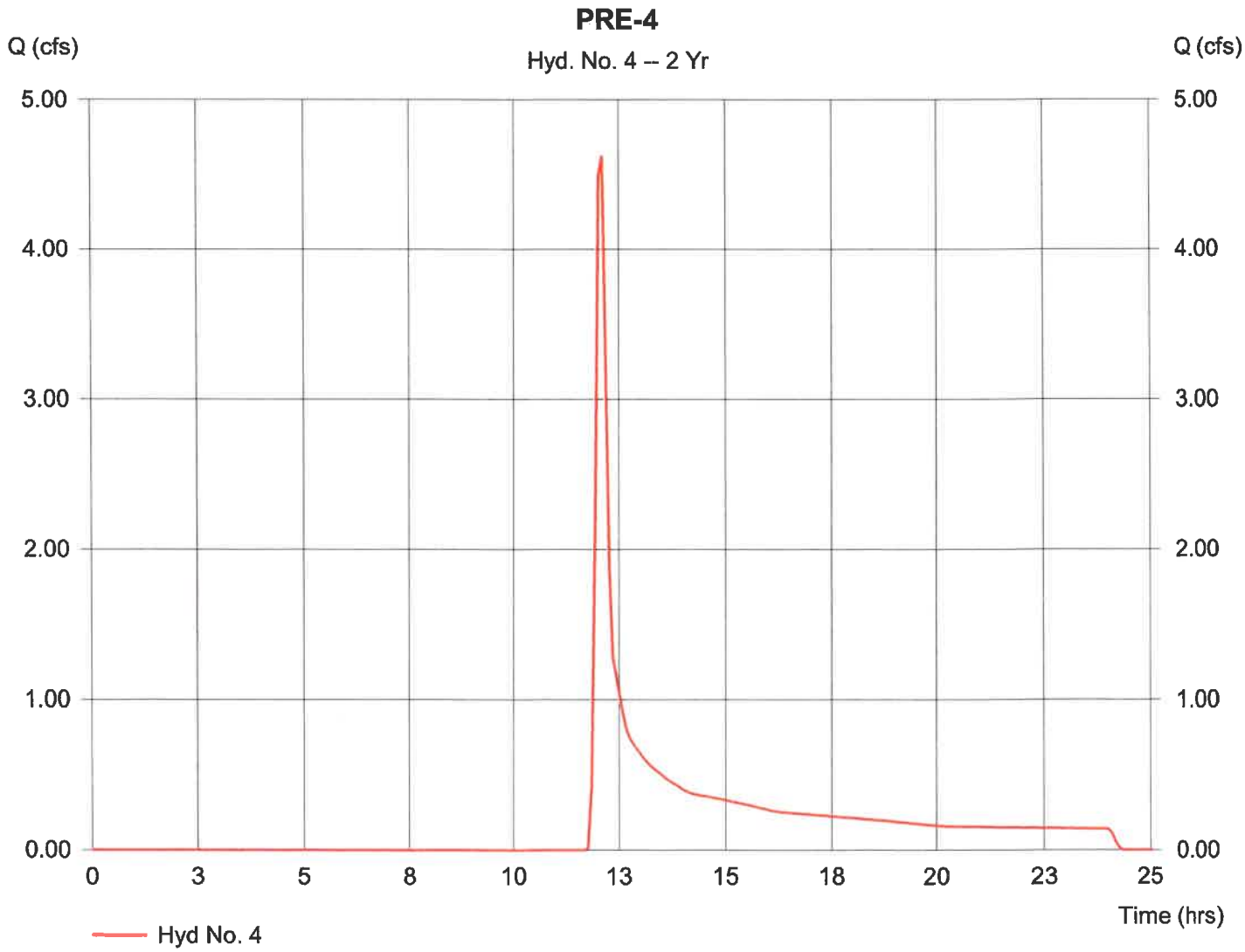
Hydraflow Hydrographs by Intelisolve | Wednesday, Oct 23 2019, 11:48 AM

Hyd. No. 4

PRE-4

Hydrograph type	= SCS Runoff	Peak discharge	= 4.62 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Drainage area	= 12.10 ac	Curve number	= 70
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 8.5 min
Total precip.	= 2.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 16,792 cuft



TR55 Tc Worksheet

Hydraflow Hydrographs by Intelisolve

Hyd. No. 4

PRE-4

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.030		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.40		0.00		0.00		
Land slope (%)	= 3.50		0.00		0.00		
Travel Time (min)	**= 2.50**	**+**	**0.00**	**+**	**0.00**	**=**	**2.50**
Shallow Concentrated Flow							
Flow length (ft)	= 200.00		0.00		0.00		
Watercourse slope (%)	= 0.90		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	= 1.53		0.00		0.00		
Travel Time (min)	**= 2.18**	**+**	**0.00**	**+**	**0.00**	**=**	**2.18**
Channel Flow							
X sectional flow area (sqft)	= 10.00		0.00		0.00		
Wetted perimeter (ft)	= 20.00		0.00		0.00		
Channel slope (%)	= 0.78		0.00		0.00		
Manning's n-value	= 0.035		0.015		0.015		
Velocity (ft/s)	= 2.36		0.00		0.00		
Flow length (ft)	= 540.0		0.0		0.0		
Travel Time (min)	**= 3.81**	**+**	**0.00**	**+**	**0.00**	**=**	**3.81**

Total Travel Time, Tc ..... 8.50 min

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

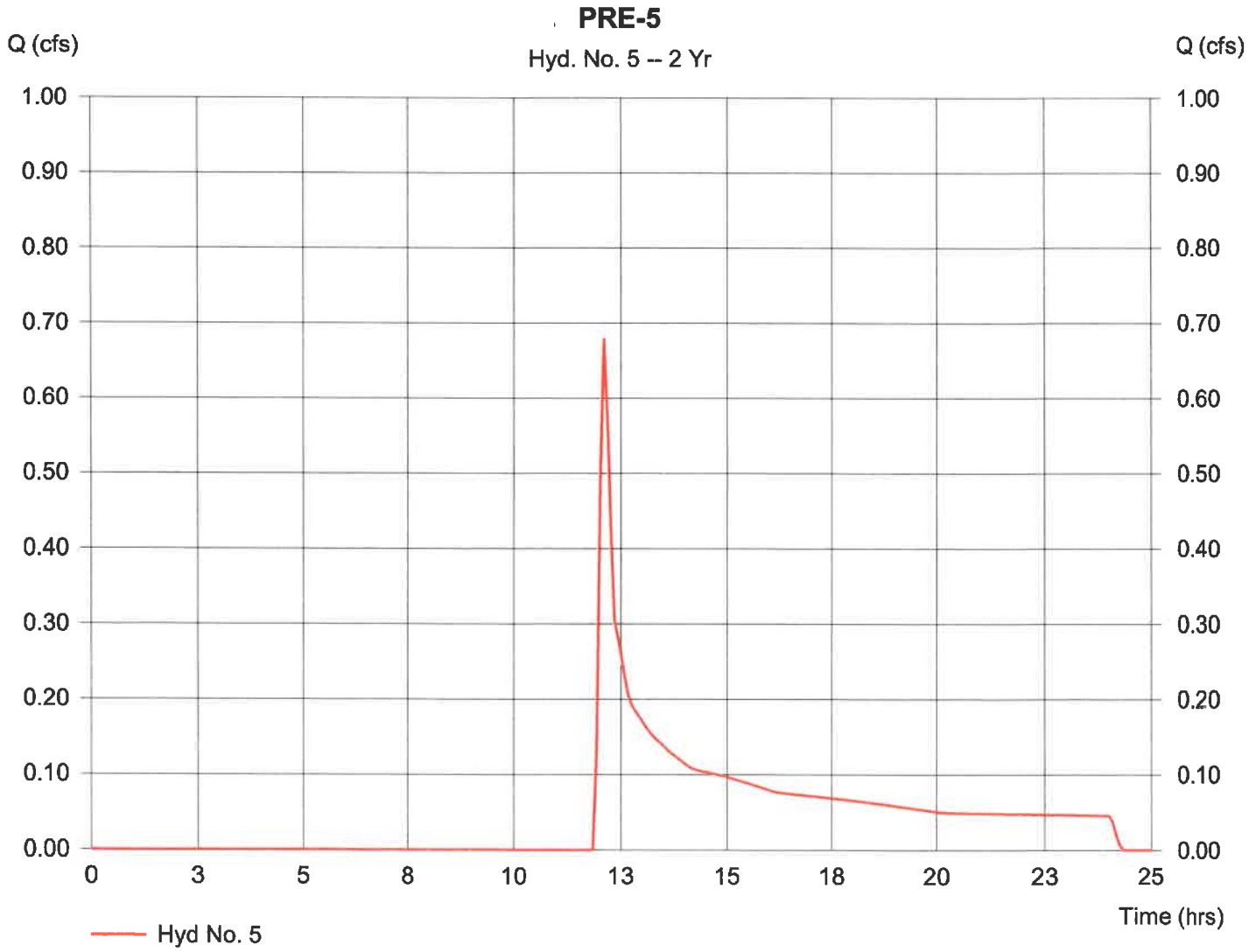
Wednesday, Oct 23 2019, 11:11 AM

Hyd. No. 5

PRE-5

Hydrograph type	= SCS Runoff	Peak discharge	= 0.68 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Drainage area	= 5.70 ac	Curve number	= 63
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 13.8 min
Total precip.	= 2.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 4,095 cuft



TR55 Tc Worksheet

Hydraflow Hydrographs by Intelisolve

Hyd. No. 5

PRE-5

Description	A	B	C	Totals
Sheet Flow				
Manning's n-value	= 0.020	0.011	0.011	
Flow length (ft)	= 200.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 2.40	0.00	0.00	
Land slope (%)	= 0.50	0.00	0.00	
Travel Time (min)	**= 6.84**	**+ 0.00**	**+ 0.00**	**= 6.84**
Shallow Concentrated Flow				
Flow length (ft)	= 185.00	0.00	0.00	
Watercourse slope (%)	= 1.10	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	= 1.69	0.00	0.00	
Travel Time (min)	**= 1.82**	**+ 0.00**	**+ 0.00**	**= 1.82**
Channel Flow				
X sectional flow area (sqft)	= 10.00	0.00	0.00	
Wetted perimeter (ft)	= 20.00	0.00	0.00	
Channel slope (%)	= 11.00	0.00	0.00	
Manning's n-value	= 0.240	0.015	0.015	
Velocity (ft/s)	= 1.29	0.00	0.00	
Flow length (ft)	= 400.0	0.0	0.0	
Travel Time (min)	**= 5.15**	**+ 0.00**	**+ 0.00**	**= 5.15**

Total Travel Time, Tc ..... 13.80 min

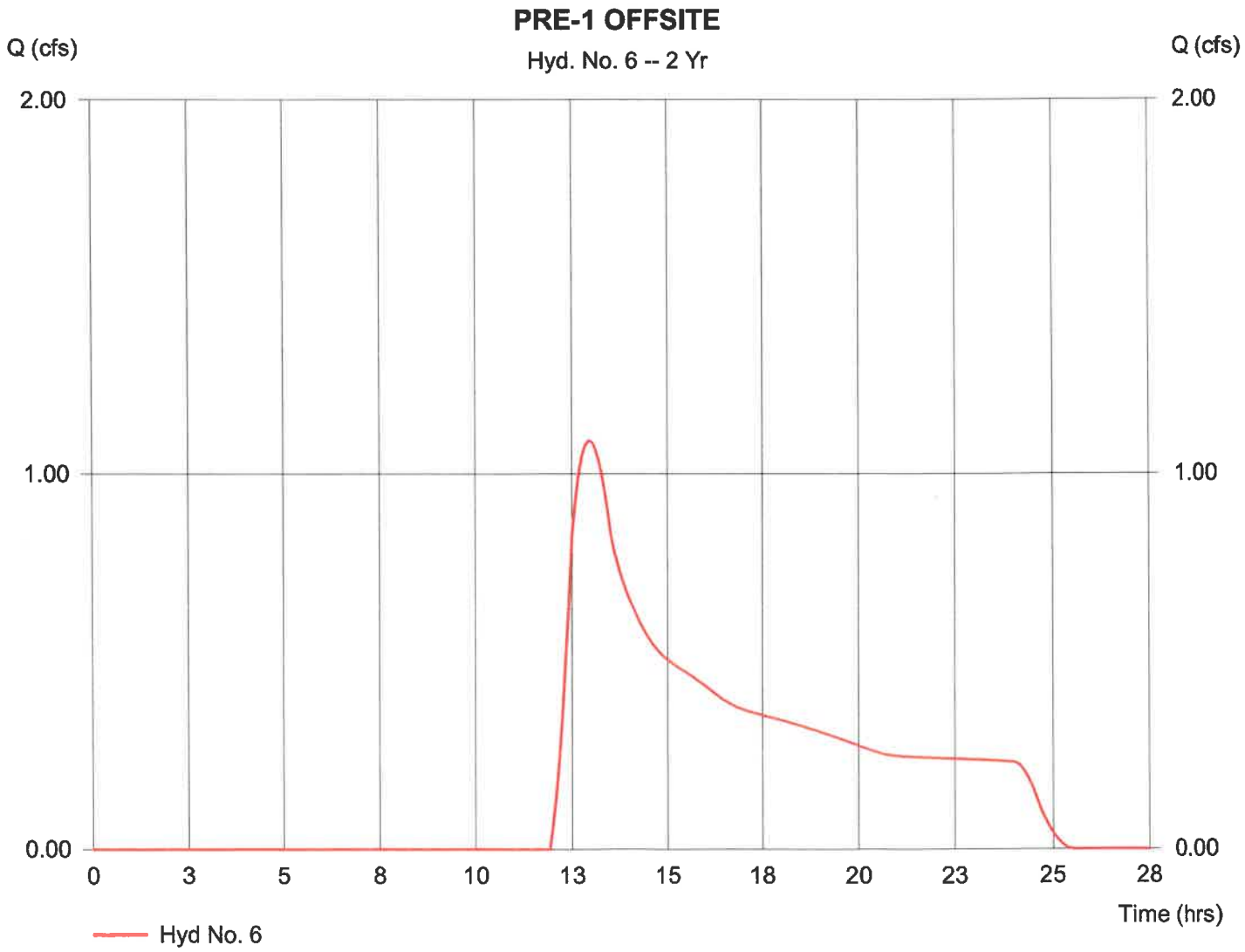
Hydrograph Plot

Hyd. No. 6

PRE-1 OFFSITE

Hydrograph type	= SCS Runoff	Peak discharge	= 1.09 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Drainage area	= 30.50 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 57.4 min
Total precip.	= 2.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 18,446 cuft



TR55 Tc Worksheet

Hydraflow Hydrographs by Intelisolve

Hyd. No. 6

PRE-1 OFFSITE

Description	A	B	C	Totals
Sheet Flow				
Manning's n-value	= 0.240	0.011	0.011	
Flow length (ft)	= 200.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 2.40	0.00	0.00	
Land slope (%)	= 0.70	0.00	0.00	
Travel Time (min)	**= 43.66** +	**0.00** +	**0.00** =	**43.66**
Shallow Concentrated Flow				
Flow length (ft)	= 400.00	0.00	0.00	
Watercourse slope (%)	= 2.80	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	= 2.70	0.00	0.00	
Travel Time (min)	**= 2.47** +	**0.00** +	**0.00** =	**2.47**
Channel Flow				
X sectional flow area (sqft)	= 10.00	10.00	0.00	
Wetted perimeter (ft)	= 20.00	20.00	0.00	
Channel slope (%)	= 7.00	0.70	0.00	
Manning's n-value	= 0.060	0.060	0.015	
Velocity (ft/s)	= 4.13	1.31	0.00	
Flow length (ft)	= 410.0	750.0	0.0	
Travel Time (min)	**= 1.65** +	**9.57** +	**0.00** =	**11.23**

Total Travel Time, Tc ..... 57.40 min

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

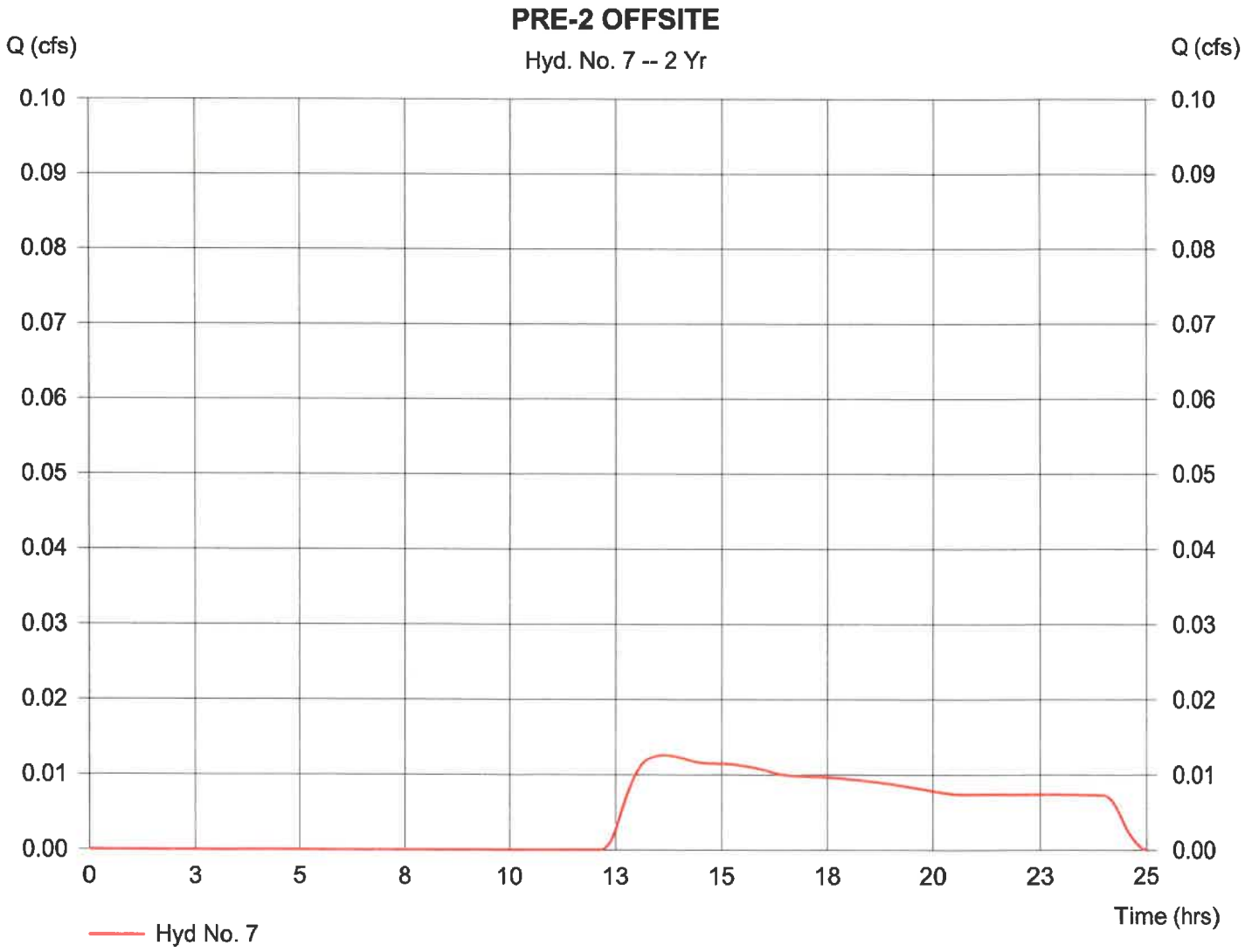
Wednesday, Oct 23 2019, 11:11 AM

Hyd. No. 7

PRE-2 OFFSITE

Hydrograph type	= SCS Runoff	Peak discharge	= 0.01 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Drainage area	= 1.70 ac	Curve number	= 55
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 37 min
Total precip.	= 2.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 392 cuft



TR55 Tc Worksheet

Hydraflow Hydrographs by Intelisolve

Hyd. No. 7

PRE-2 OFFSITE

Description	A	B	C	Totals
Sheet Flow				
Manning's n-value	= 0.400	0.011	0.011	
Flow length (ft)	= 200.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 2.40	0.00	0.00	
Land slope (%)	= 3.50	0.00	0.00	
Travel Time (min)	**= 34.51** +	**0.00** +	**0.00** =	**34.51**
Shallow Concentrated Flow				
Flow length (ft)	= 235.00	165.00	0.00	
Watercourse slope (%)	= 4.90	1.50	0.00	
Surface description	= Unpaved	Unpaved	Paved	
Average velocity (ft/s)	= 3.57	1.98	0.00	
Travel Time (min)	**= 1.10** +	**1.39** +	**0.00** =	**2.49**
Channel Flow				
X sectional flow area (sqft)	= 0.00	0.00	0.00	
Wetted perimeter (ft)	= 0.00	0.00	0.00	
Channel slope (%)	= 0.00	0.00	0.00	
Manning's n-value	= 0.015	0.015	0.015	
Velocity (ft/s)	= 0.00	0.00	0.00	
Flow length (ft)	= 0.0	0.0	0.0	
Travel Time (min)	**= 0.00** +	**0.00** +	**0.00** =	**0.00**

Total Travel Time, Tc ..... 37.00 min

SECTION #5

Post-Developed TR-55

DEV1

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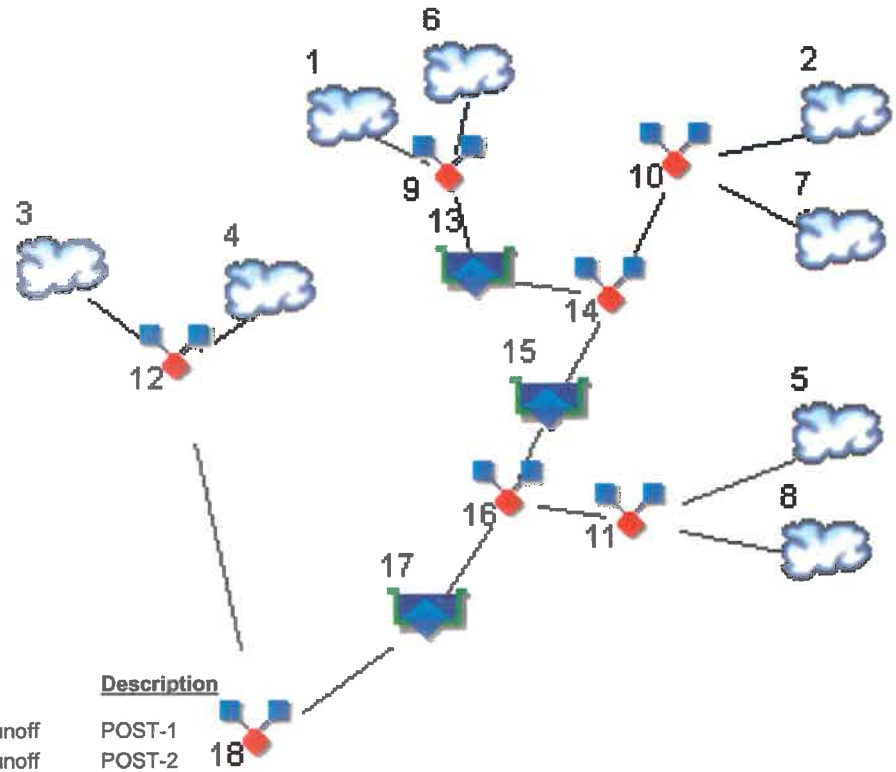
POST-DEVELOPED DRAINAGE PATTERNS

Quarry Bluff, LLC

BAUDHUIN SURVEYING & ENGINEERING
312 N. 5TH AVE.
P.O. BOX 105
STURGEON BAY, WI.
54235
PHONE: 920-743-8211

PATH: Y:\PROJECTS\	PROJECT DIRECTOR: Bradley-Dale 2001	DRAWN BY: RMB
PLAN NAME: 061-DRGPL		DESIGNED BY: PJH
REVISED DATE: 12-3-19		DATE: 7-22-19
SCALE: AS NOTED		JOB NUMBER: 22061



Legend

Hyd.	Origin	Description
1	SCS Runoff	POST-1
2	SCS Runoff	POST-2
3	SCS Runoff	POST-3
4	SCS Runoff	POST-4
5	SCS Runoff	POST-5
6	SCS Runoff	POST-OFF1
7	SCS Runoff	POST-OFF2
8	SCS Runoff	POST-OFF5
9	Combine	BASIN 1 TOTAL
10	Combine	BASIN 2 TOTAL
11	Combine	BASIN 5 TOTAL
12	Combine	TO PARK
13	Reservoir	POND A
14	Combine	TOTAL TO POND B
15	Reservoir	POND B
16	Combine	AT ENTRANCE
17	Reservoir	POND C
18	Combine	TOTAL SITE

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow Hyd(s)	Peak Outflow (cfs)								Hydrograph description
			1-Yr	2-Yr	3-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr	
1	SCS Runoff	-------	11.31	14.01	-------	24.70	33.06	41.82	50.88	56.42	POST-1
2	SCS Runoff	-------	3.81	4.72	-------	8.32	11.13	14.08	17.13	19.00	POST-2
3	SCS Runoff	-------	0.39	0.50	-------	0.90	1.21	1.53	1.87	2.08	POST-3
4	SCS Runoff	-------	2.55	3.18	-------	5.59	7.46	9.42	11.44	12.67	POST-4
5	SCS Runoff	-------	3.84	4.90	-------	9.34	12.88	16.62	20.53	22.93	POST-5
6	SCS Runoff	-------	0.43	0.72	-------	2.84	5.11	7.92	11.13	13.22	POST-OFF1
7	SCS Runoff	-------	0.30	0.56	-------	2.80	5.13	7.89	10.96	13.04	POST-OFF2
8	SCS Runoff	-------	0.00	0.01	-------	0.04	0.11	0.21	0.33	0.41	POST-OFF5
9	Combine	1, 6,	11.48	14.35	-------	26.50	36.51	47.41	59.00	66.22	BASIN 1 TOTAL
10	Combine	2, 7,	4.10	5.28	-------	10.89	15.67	20.89	26.51	30.20	BASIN 2 TOTAL
11	Combine	5, 8,	3.84	4.90	-------	9.36	12.93	16.73	20.70	23.16	BASIN 5 TOTAL
12	Combine	3, 4,	2.94	3.67	-------	6.48	8.66	10.95	13.31	14.76	TO PARK
13	Reservoir	9	0.17	0.20	-------	0.27	0.32	0.65	2.64	4.08	POND A
14	Combine	10, 13	4.14	5.33	-------	10.98	15.80	21.05	26.66	30.37	TOTAL TO POND B
15	Reservoir	14	0.18	0.20	-------	0.27	0.88	1.74	3.66	5.54	POND B
16	Combine	11, 15	3.85	4.92	-------	9.41	13.03	16.86	20.86	23.34	AT ENTRANCE
17	Reservoir	16	0.23	0.26	-------	0.52	1.20	2.75	6.99	8.26	POND C
18	Combine	12, 17	2.99	3.75	-------	6.62	8.85	11.18	13.57	16.09	TOTAL SITE

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	11.31	5	740	63,124	----	------	------	POST-1
2	SCS Runoff	3.81	5	740	21,254	----	------	------	POST-2
3	SCS Runoff	0.39	5	725	1,625	----	------	------	POST-3
4	SCS Runoff	2.55	5	725	10,245	----	------	------	POST-4
5	SCS Runoff	3.84	5	730	16,660	----	------	------	POST-5
6	SCS Runoff	0.43	5	785	8,690	----	------	------	POST-OFF1
7	SCS Runoff	0.30	5	745	4,668	----	------	------	POST-OFF2
8	SCS Runoff	0.00	5	935	103	----	------	------	POST-OFF5
9	Combine	11.48	5	740	71,814	1, 6,	------	------	BASIN 1 TOTAL
10	Combine	4.10	5	740	25,922	2, 7,	------	------	BASIN 2 TOTAL
11	Combine	3.84	5	730	16,763	5, 8,	------	------	BASIN 5 TOTAL
12	Combine	2.94	5	725	11,871	3, 4,	------	------	TO PARK
13	Reservoir	0.17	5	1475	64,654	9	634.77	65,087	POND A
14	Combine	4.14	5	740	90,576	10, 13	------	------	TOTAL TO POND B
	Reservoir	0.18	5	1490	87,767	14	633.28	25,485	POND B
16	Combine	3.85	5	730	104,529	11, 15	------	------	AT ENTRANCE
17	Reservoir	0.23	5	1460	103,278	16	595.19	14,499	POND C
18	Combine	2.99	5	730	115,148	12, 17	------	------	TOTAL SITE

Hydrograph Plot

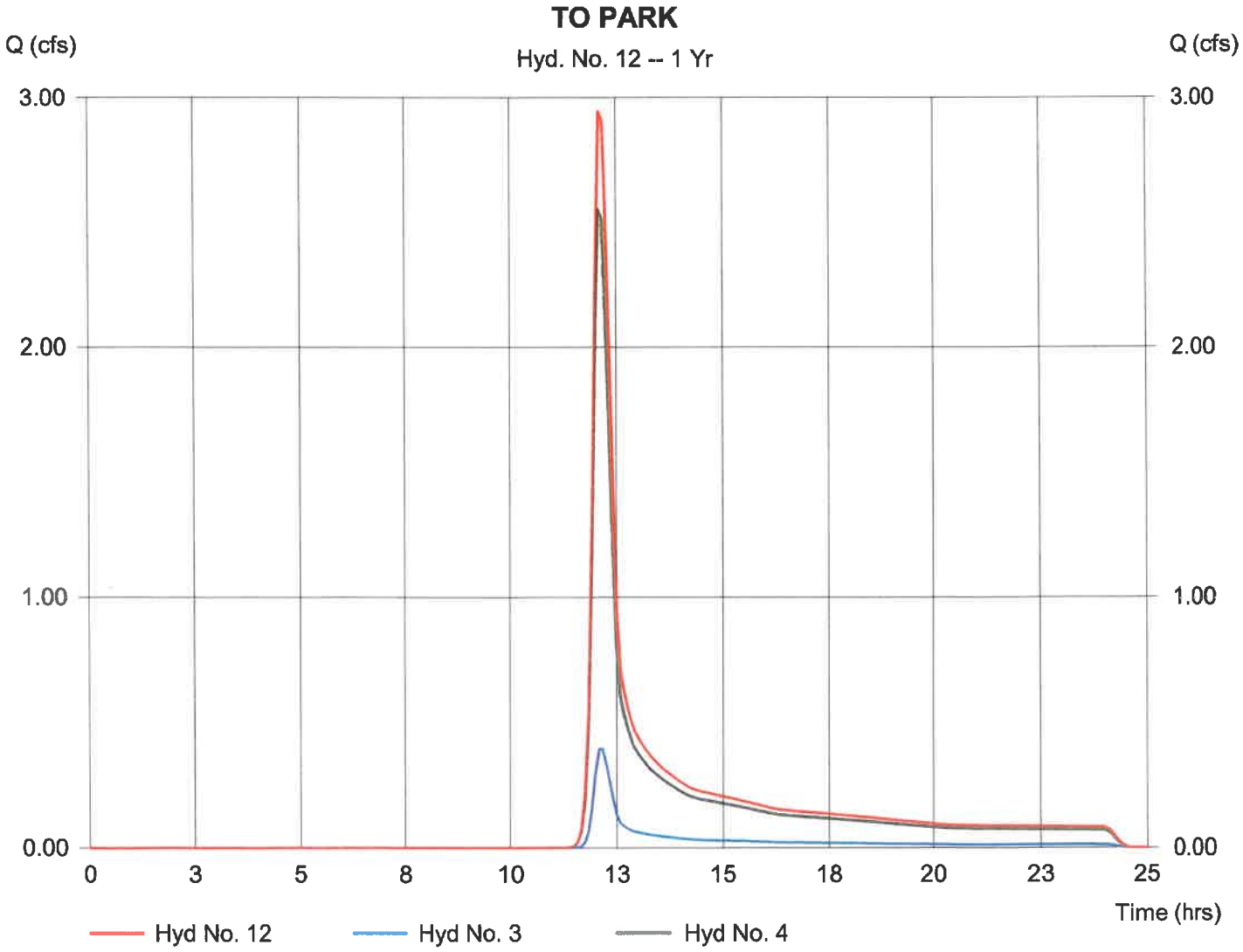
Hydraflow Hydrographs by Intelisolve — Tuesday, Dec 3 2019, 9:37 PM

Hyd. No. 12

TO PARK

Hydrograph type	= Combine	Peak discharge	= 2.94 cfs
Storm frequency	= 1 yrs	Time interval	= 5 min
Inflow hyds.	= 3, 4		

Hydrograph Volume = 11,871 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Tuesday, Dec 3 2019, 9:38 PM

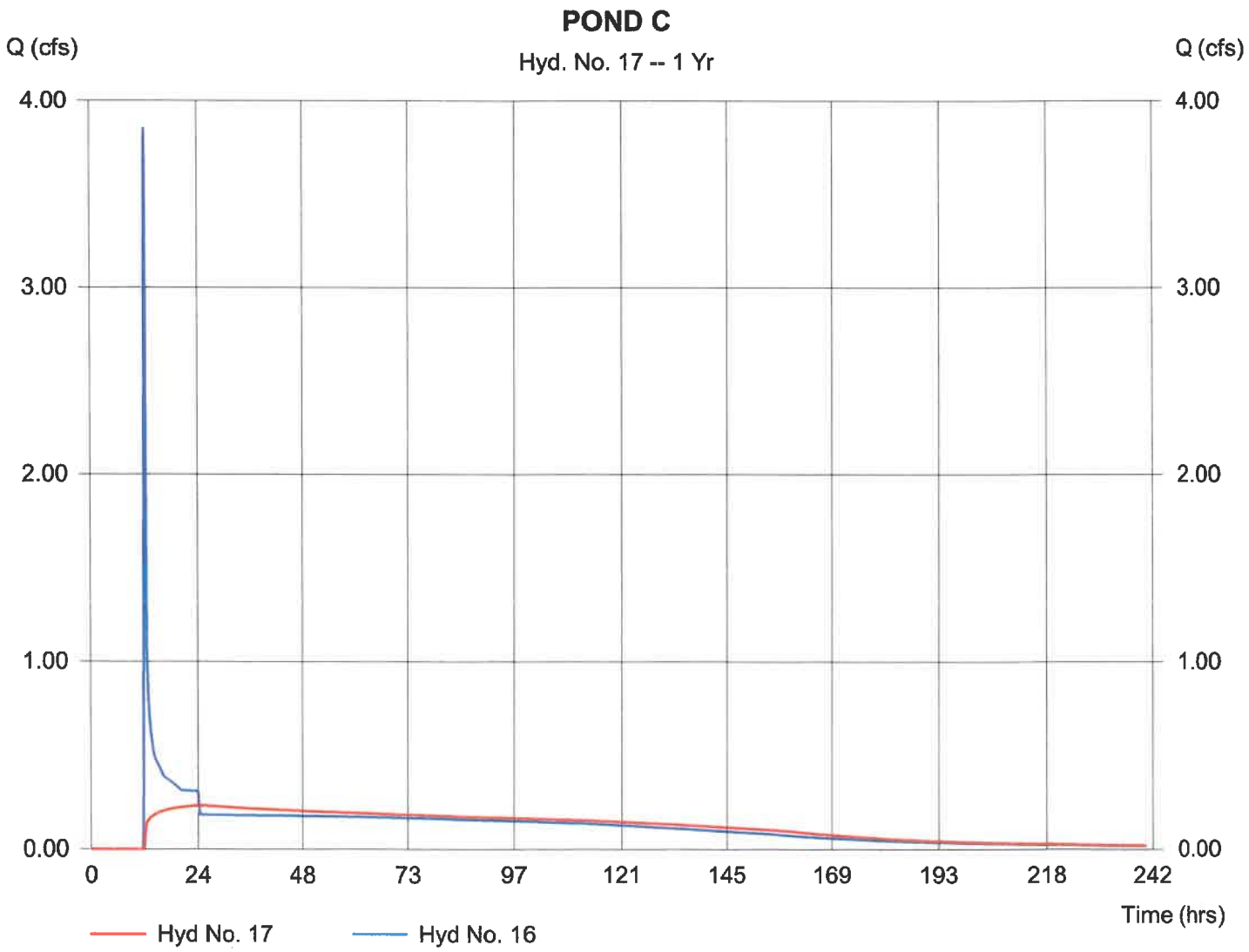
Hyd. No. 17

POND C

Hydrograph type	= Reservoir	Peak discharge	= 0.23 cfs
Storm frequency	= 1 yrs	Time interval	= 5 min
Inflow hyd. No.	= 16	Max. Elevation	= 595.19 ft
Reservoir name	= POND C	Max. Storage	= 14,499 cuft

Storage Indication method used.

Hydrograph Volume = 103,278 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

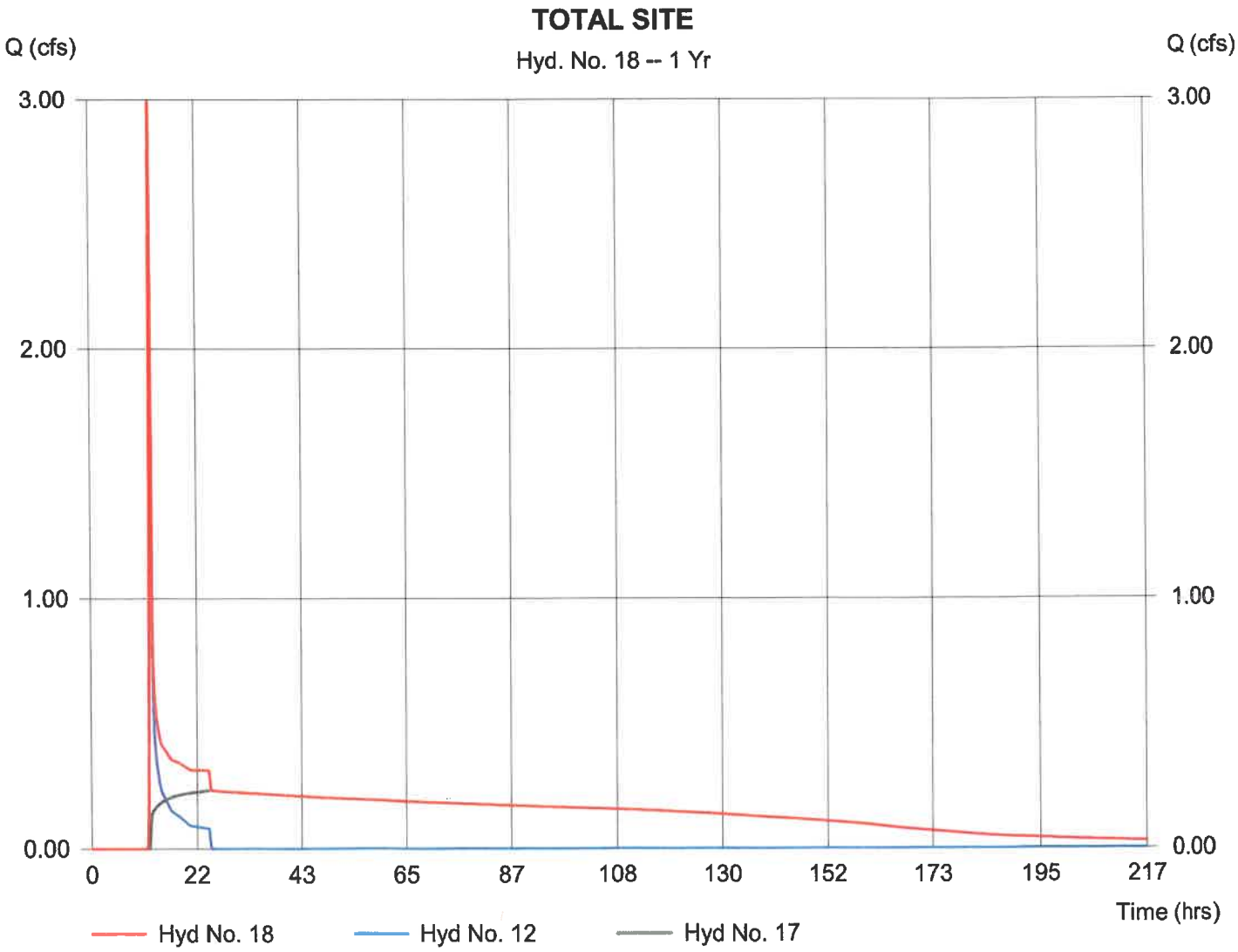
Tuesday, Dec 3 2019, 9:38 PM

Hyd. No. 18

TOTAL SITE

Hydrograph type	= Combine	Peak discharge	= 2.99 cfs
Storm frequency	= 1 yrs	Time interval	= 5 min
Inflow hyds.	= 12, 17		

Hydrograph Volume = 115,148 cuft



Hydrograph Summary Report

d. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	14.01	5	740	76,088	----	------	------	POST-1
2	SCS Runoff	4.72	5	740	25,619	----	------	------	POST-2
3	SCS Runoff	0.50	5	725	1,970	----	------	------	POST-3
4	SCS Runoff	3.18	5	725	12,350	----	------	------	POST-4
5	SCS Runoff	4.90	5	730	20,448	----	------	------	POST-5
6	SCS Runoff	0.72	5	775	12,277	----	------	------	POST-OFF1
7	SCS Runoff	0.56	5	740	6,595	----	------	------	POST-OFF2
8	SCS Runoff	0.01	5	820	185	----	------	------	POST-OFF5
9	Combine	14.35	5	740	88,364	1, 6,	------	------	BASIN 1 TOTAL
10	Combine	5.28	5	740	32,214	2, 7,	------	------	BASIN 2 TOTAL
11	Combine	4.90	5	730	20,632	5, 8,	------	------	BASIN 5 TOTAL
12	Combine	3.67	5	725	14,320	3, 4,	------	------	TO PARK
13	Reservoir	0.20	5	1480	79,939	9	634.95	80,573	POND A
14	Combine	5.33	5	740	112,153	10, 13	------	------	TOTAL TO POND B
15	Reservoir	0.20	5	1495	108,872	14	633.44	31,934	POND B
16	Combine	4.92	5	730	129,504	11, 15	------	------	AT ENTRANCE
17	Reservoir	0.26	5	1460	128,018	16	595.45	18,018	POND C
18	Combine	3.75	5	725	142,337	12, 17	------	------	TOTAL SITE

Hydrograph Plot

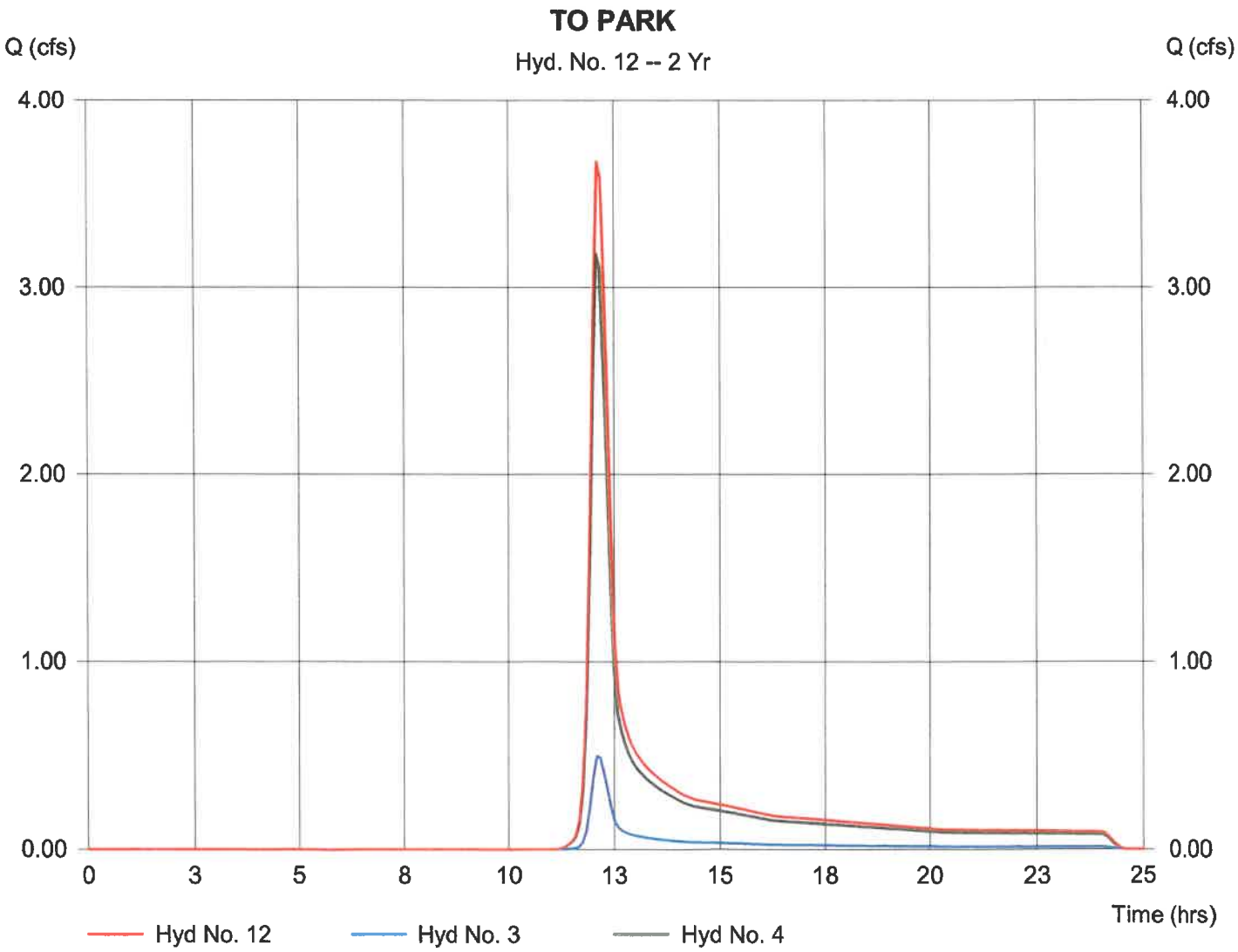
Hydraflow Hydrographs by Intelisolve | Tuesday, Dec 3 2019, 9:37 PM

Hyd. No. 12

TO PARK

Hydrograph type	= Combine	Peak discharge	= 3.67 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Inflow hyds.	= 3, 4		

Hydrograph Volume = 14,320 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Tuesday, Dec 3 2019, 9:38 PM

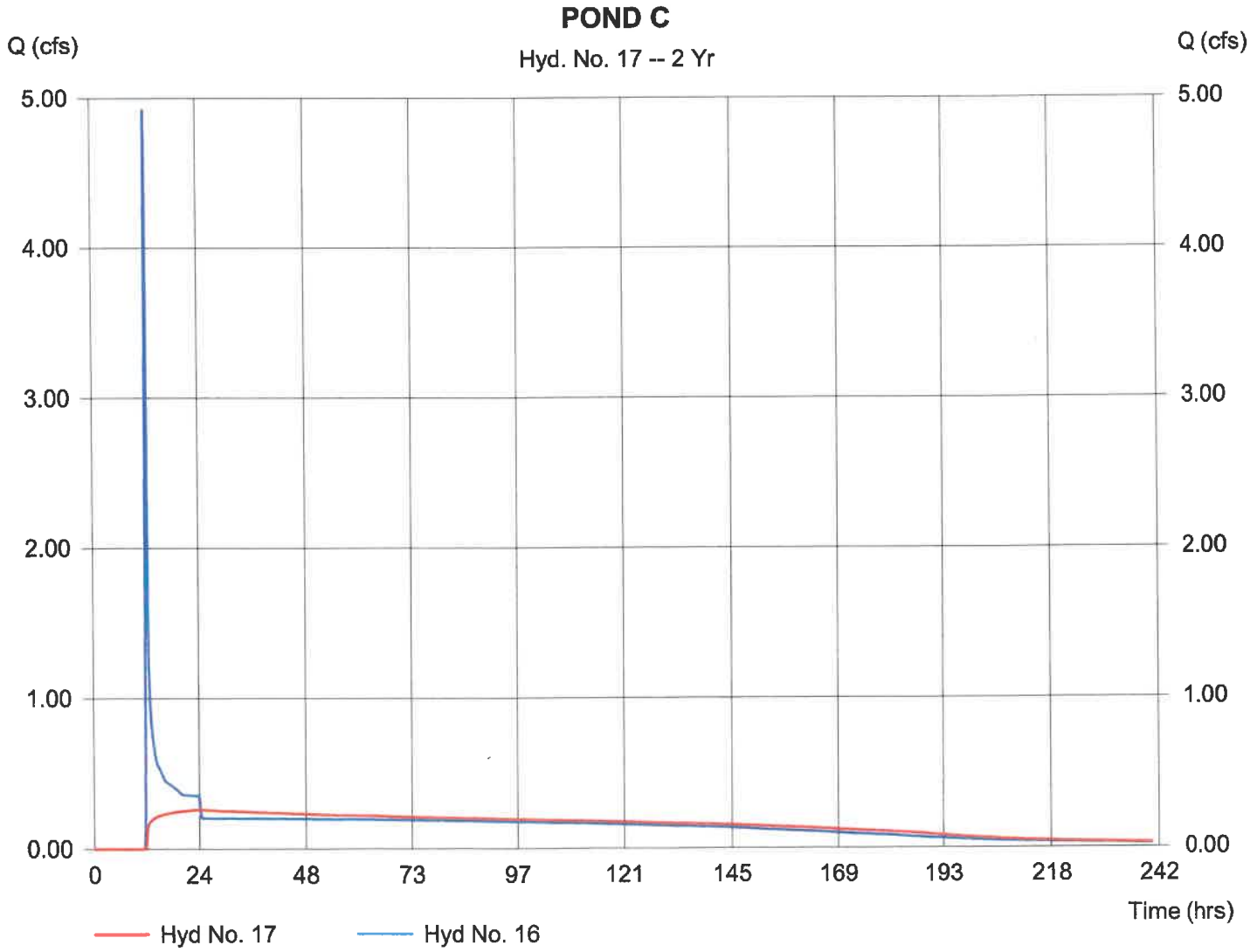
Hyd. No. 17

POND C

Hydrograph type	= Reservoir	Peak discharge	= 0.26 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Inflow hyd. No.	= 16	Max. Elevation	= 595.45 ft
Reservoir name	= POND C	Max. Storage	= 18,018 cuft

Storage Indication method used.

Hydrograph Volume = 128,018 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

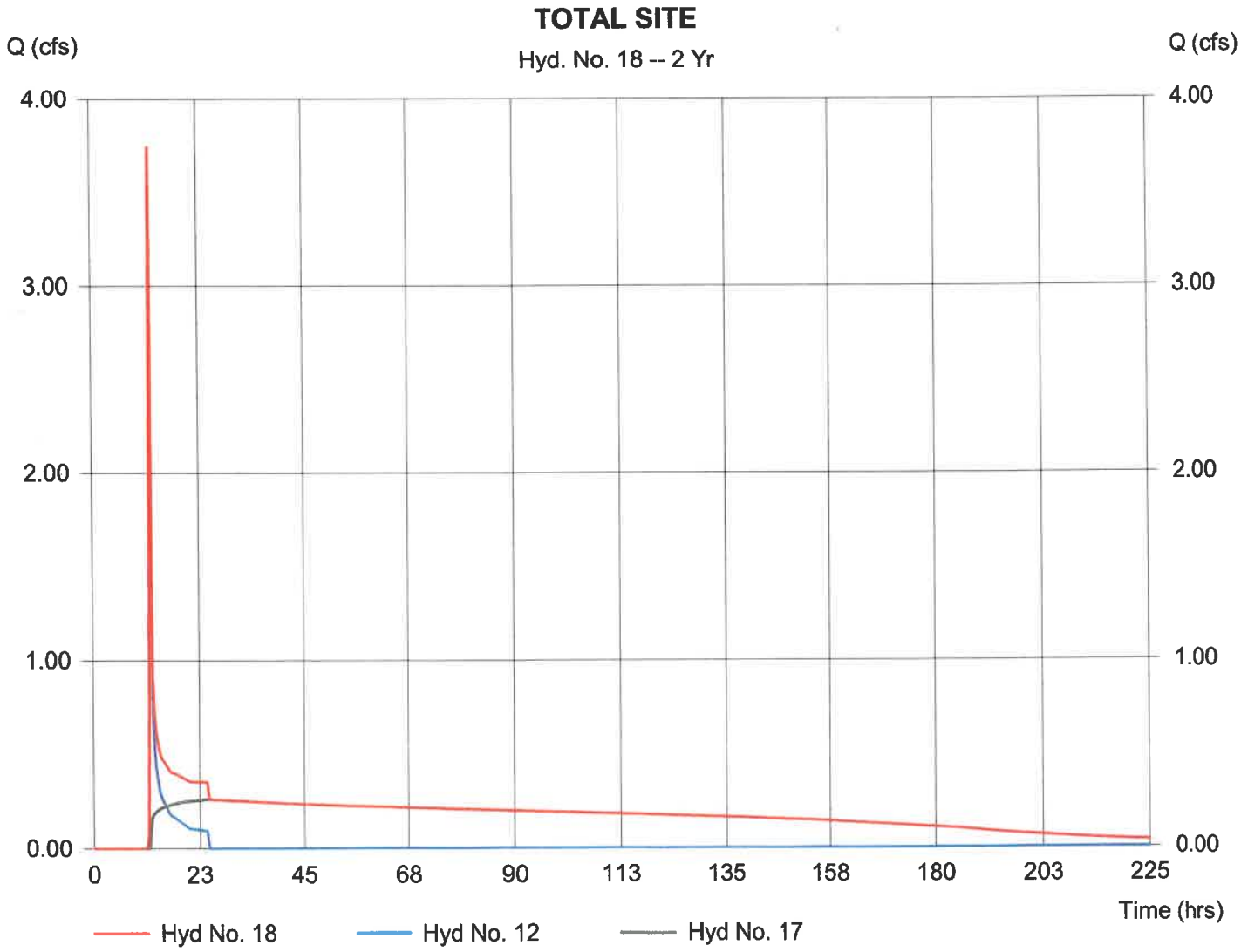
Tuesday, Dec 3 2019, 9:38 PM

Hyd. No. 18

TOTAL SITE

Hydrograph type	= Combine	Peak discharge	= 3.75 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Inflow hyds.	= 12, 17		

Hydrograph Volume = 142,337 cuft



Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	33.06	5	735	165,428	----	------	------	POST-1
2	SCS Runoff	11.13	5	735	55,700	----	------	------	POST-2
3	SCS Runoff	1.21	5	725	4,371	----	------	------	POST-3
4	SCS Runoff	7.46	5	725	26,850	----	------	------	POST-4
5	SCS Runoff	12.88	5	725	47,350	----	------	------	POST-5
6	SCS Runoff	5.11	5	750	46,320	----	------	------	POST-OFF1
7	SCS Runoff	5.13	5	730	24,883	----	------	------	POST-OFF2
8	SCS Runoff	0.11	5	745	1,075	----	------	------	POST-OFF5
9	Combine	36.51	5	740	211,748	1, 6,	------	------	BASIN 1 TOTAL
10	Combine	15.67	5	735	80,583	2, 7,	------	------	BASIN 2 TOTAL
11	Combine	12.93	5	725	48,425	5, 8,	------	------	BASIN 5 TOTAL
12	Combine	8.66	5	725	31,221	3, 4,	------	------	TO PARK
13	Reservoir	0.32	5	1480	180,091	9	636.21	198,331	POND A
14	Combine	15.80	5	735	260,674	10, 13	------	------	TOTAL TO POND B
	Reservoir	0.88	5	1250	232,770	14	634.31	69,233	POND B
16	Combine	13.03	5	725	281,195	11, 15	------	------	AT ENTRANCE
17	Reservoir	1.20	5	1245	268,226	16	596.32	30,316	POND C
18	Combine	8.85	5	725	299,447	12, 17	------	------	TOTAL SITE

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

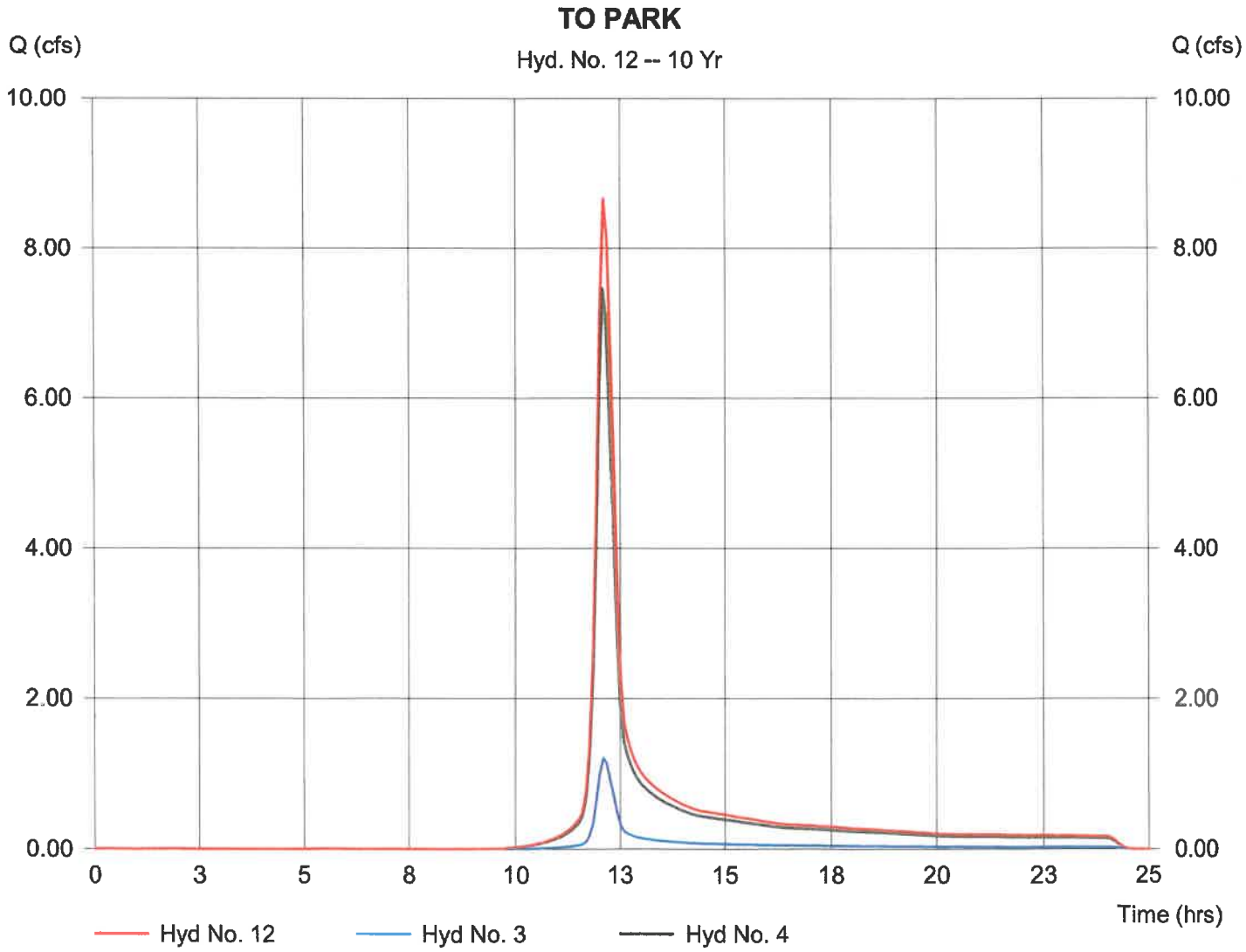
Tuesday, Dec 3 2019, 9:37 PM

Hyd. No. 12

TO PARK

Hydrograph type	= Combine	Peak discharge	= 8.66 cfs
Storm frequency	= 10 yrs	Time interval	= 5 min
Inflow hyds.	= 3, 4		

Hydrograph Volume = 31,221 cuft



Hydrograph Plot

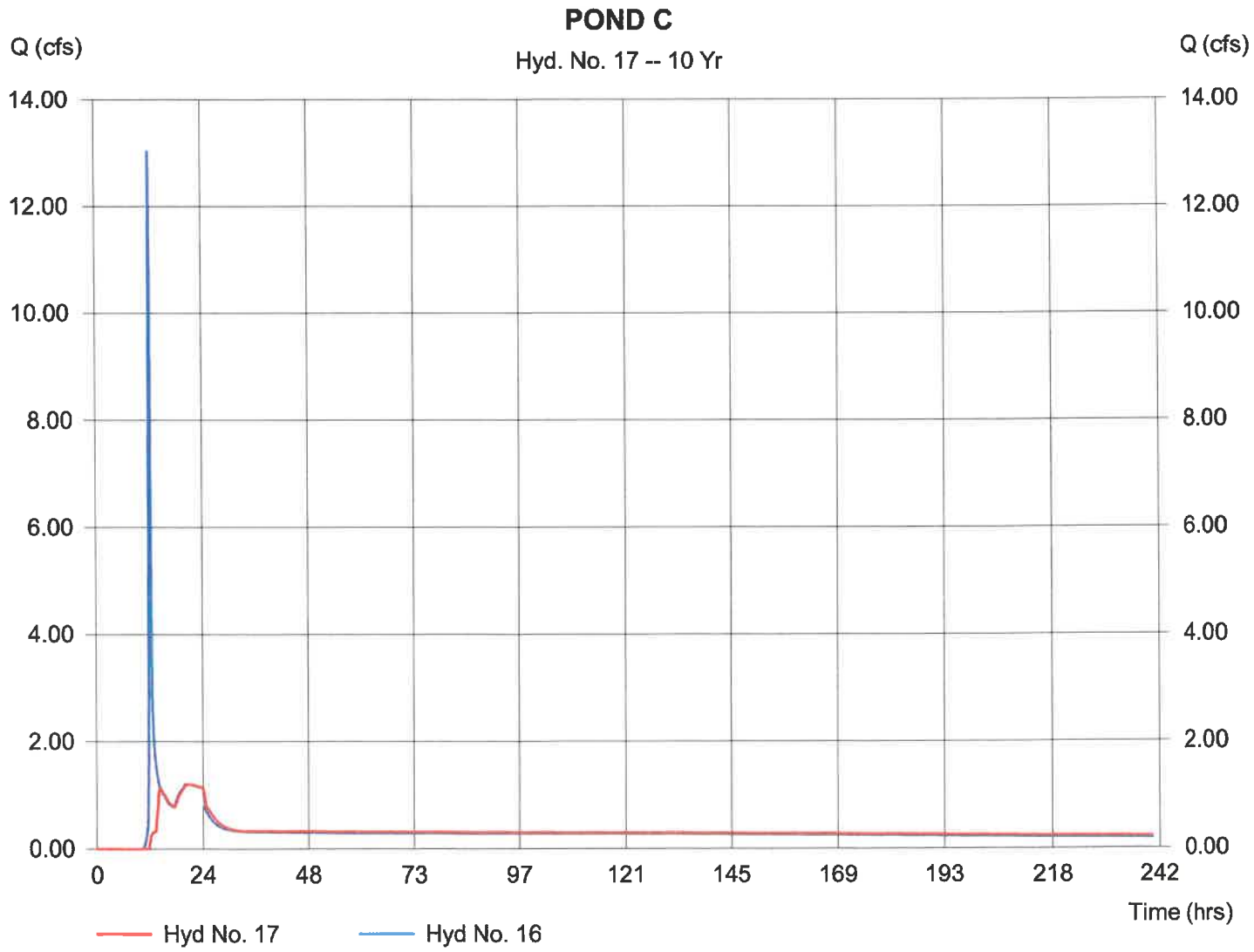
Hydraflow Hydrographs by Intelisolve | Tuesday, Dec 3 2019, 9:38 PM

Hyd. No. 17

POND C

Hydrograph type	= Reservoir	Peak discharge	= 1.20 cfs
Storm frequency	= 10 yrs	Time interval	= 5 min
Inflow hyd. No.	= 16	Max. Elevation	= 596.32 ft
Reservoir name	= POND C	Max. Storage	= 30,316 cuft

Storage Indication method used. | Hydrograph Volume = 268,226 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

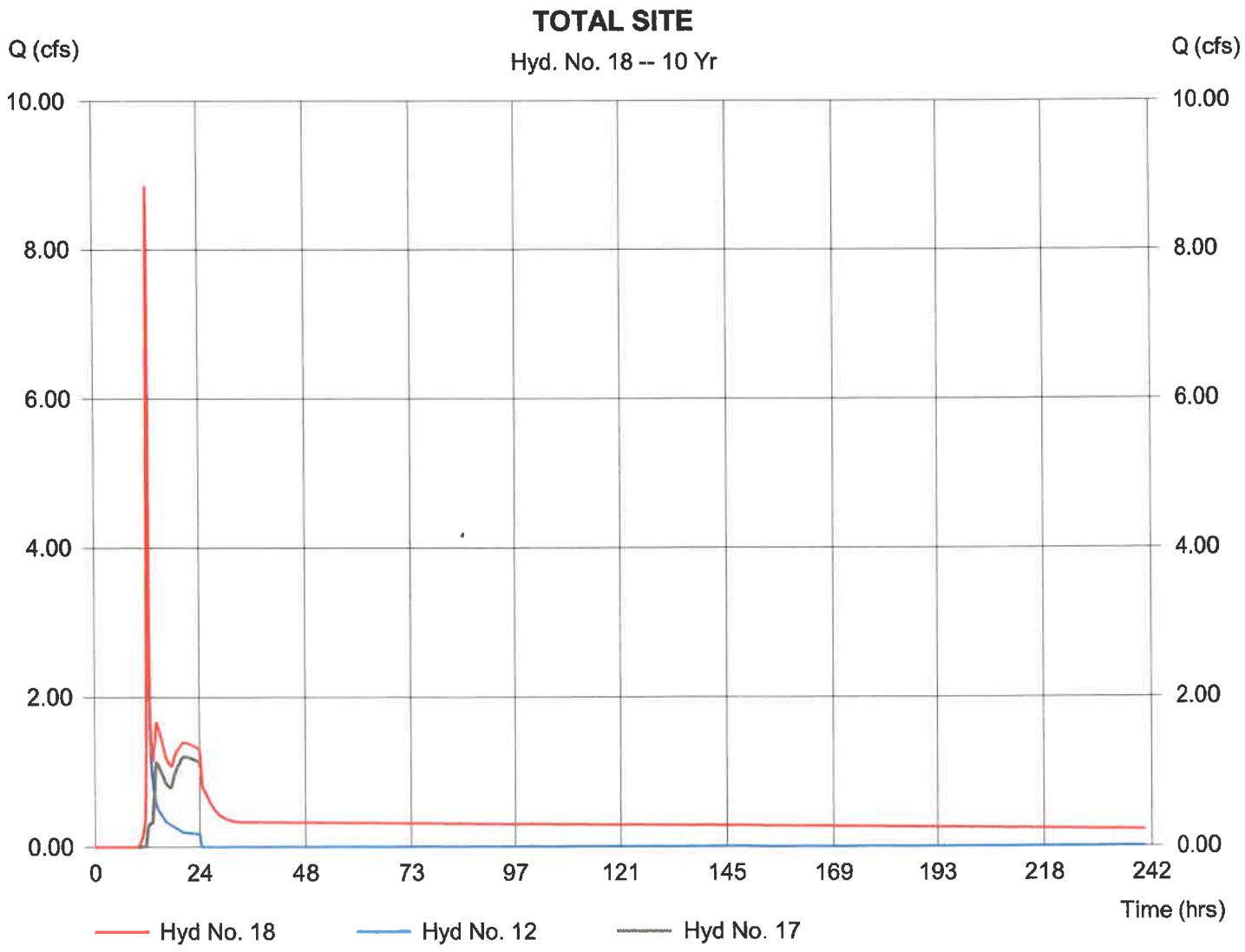
Tuesday, Dec 3 2019, 9:38 PM

Hyd. No. 18

TOTAL SITE

Hydrograph type	= Combine	Peak discharge	= 8.85 cfs
Storm frequency	= 10 yrs	Time interval	= 5 min
Inflow hyds.	= 12, 17		

Hydrograph Volume = 299,447 cuft



Hydrograph Summary Report

d. no.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	56.42	5	735	276,141	----	------	------	POST-1
2	SCS Runoff	19.00	5	735	92,977	----	------	------	POST-2
3	SCS Runoff	2.08	5	725	7,375	----	------	------	POST-3
4	SCS Runoff	12.67	5	725	44,819	----	------	------	POST-4
5	SCS Runoff	22.93	5	725	81,675	----	------	------	POST-5
6	SCS Runoff	13.22	5	750	98,212	----	------	------	POST-OFF1
7	SCS Runoff	13.04	5	725	52,760	----	------	------	POST-OFF2
8	SCS Runoff	0.41	5	740	2,635	----	------	------	POST-OFF5
9	Combine	66.22	5	740	374,353	1, 6,	------	------	BASIN 1 TOTAL
10	Combine	30.20	5	730	145,737	2, 7,	------	------	BASIN 2 TOTAL
11	Combine	23.16	5	725	84,310	5, 8,	------	------	BASIN 5 TOTAL
12	Combine	14.76	5	725	52,194	3, 4,	------	------	TO PARK
13	Reservoir	4.08	5	990	321,147	9	636.94	272,905	POND A
14	Combine	30.37	5	730	466,884	10, 13	------	------	TOTAL TO POND B
15	Reservoir	5.54	5	1010	424,825	14	634.51	78,852	POND B
16	Combine	23.34	5	725	509,135	11, 15	------	------	AT ENTRANCE
17	Reservoir	8.26	5	745	491,670	16	596.73	36,546	POND C
18	Combine	16.09	5	740	543,864	12, 17	------	------	TOTAL SITE

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

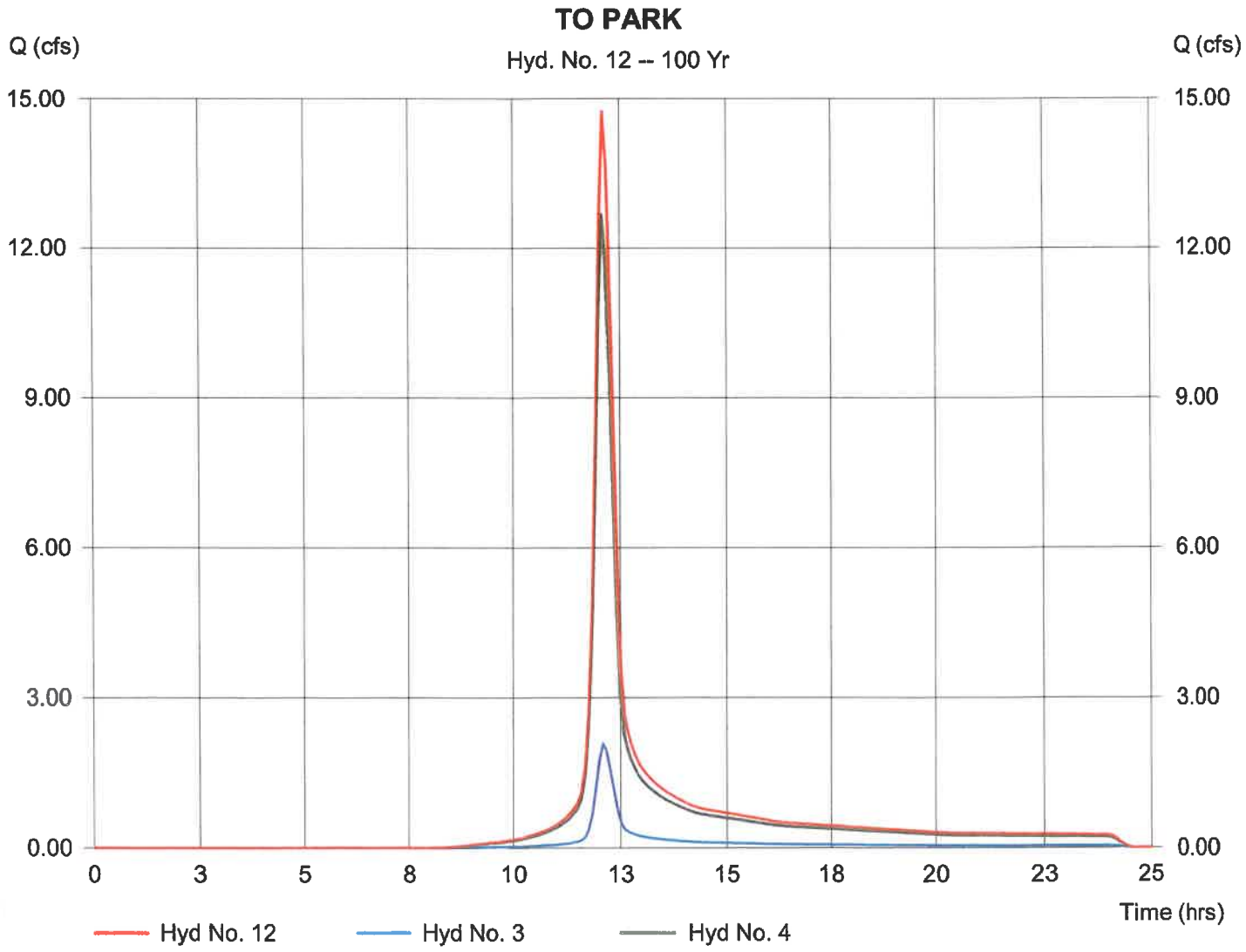
Tuesday, Dec 3 2019, 9:37 PM

Hyd. No. 12

TO PARK

Hydrograph type	= Combine	Peak discharge	= 14.76 cfs
Storm frequency	= 100 yrs	Time interval	= 5 min
Inflow hyds.	= 3, 4		

Hydrograph Volume = 52,194 cuft



Hydrograph Plot

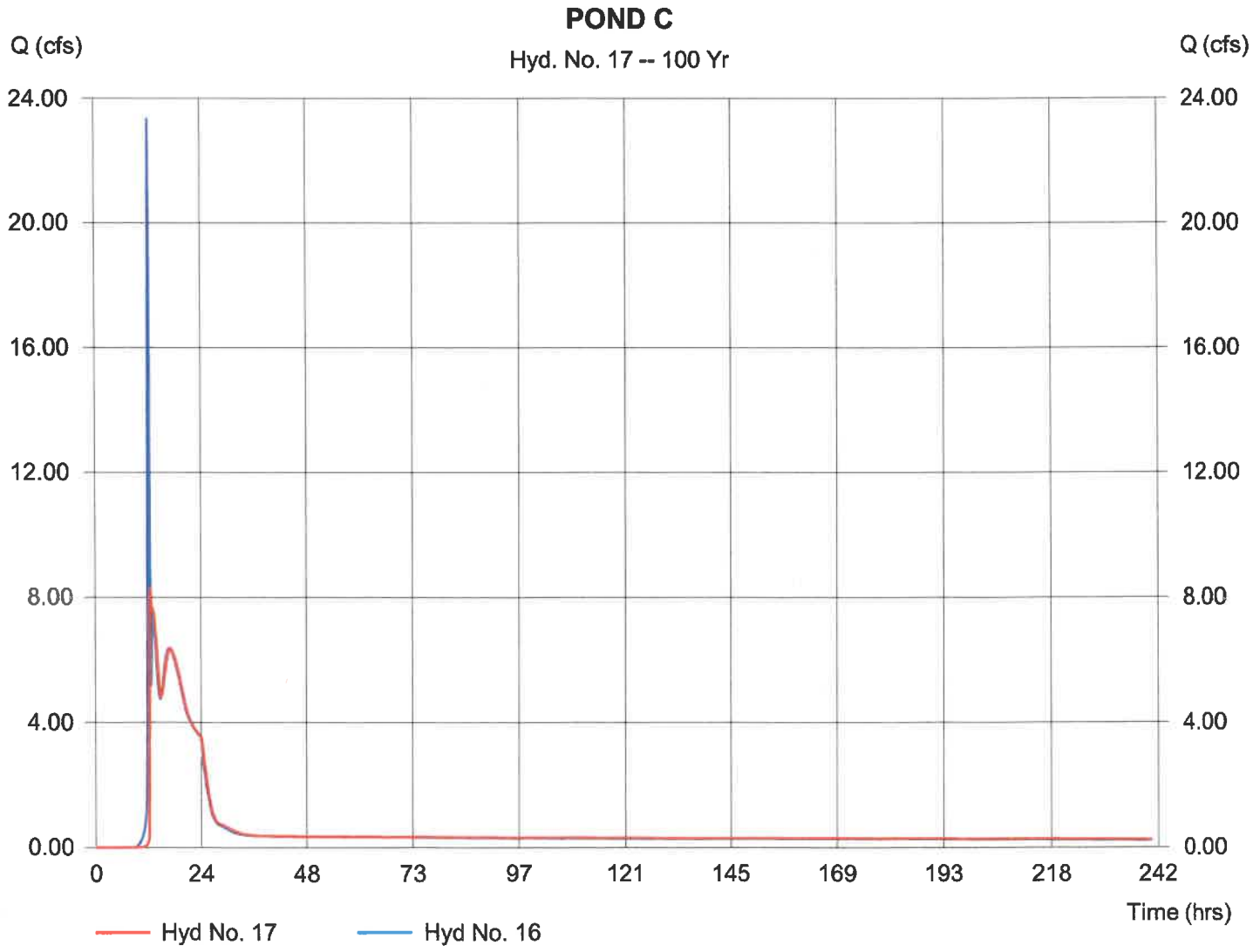
Hydraflow Hydrographs by Intelisolve | Tuesday, Dec 3 2019, 9:38 PM

Hyd. No. 17

POND C

Hydrograph type	= Reservoir	Peak discharge	= 8.26 cfs
Storm frequency	= 100 yrs	Time interval	= 5 min
Inflow hyd. No.	= 16	Max. Elevation	= 596.73 ft
Reservoir name	= POND C	Max. Storage	= 36,546 cuft

Storage Indication method used. | Hydrograph Volume = 491,670 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

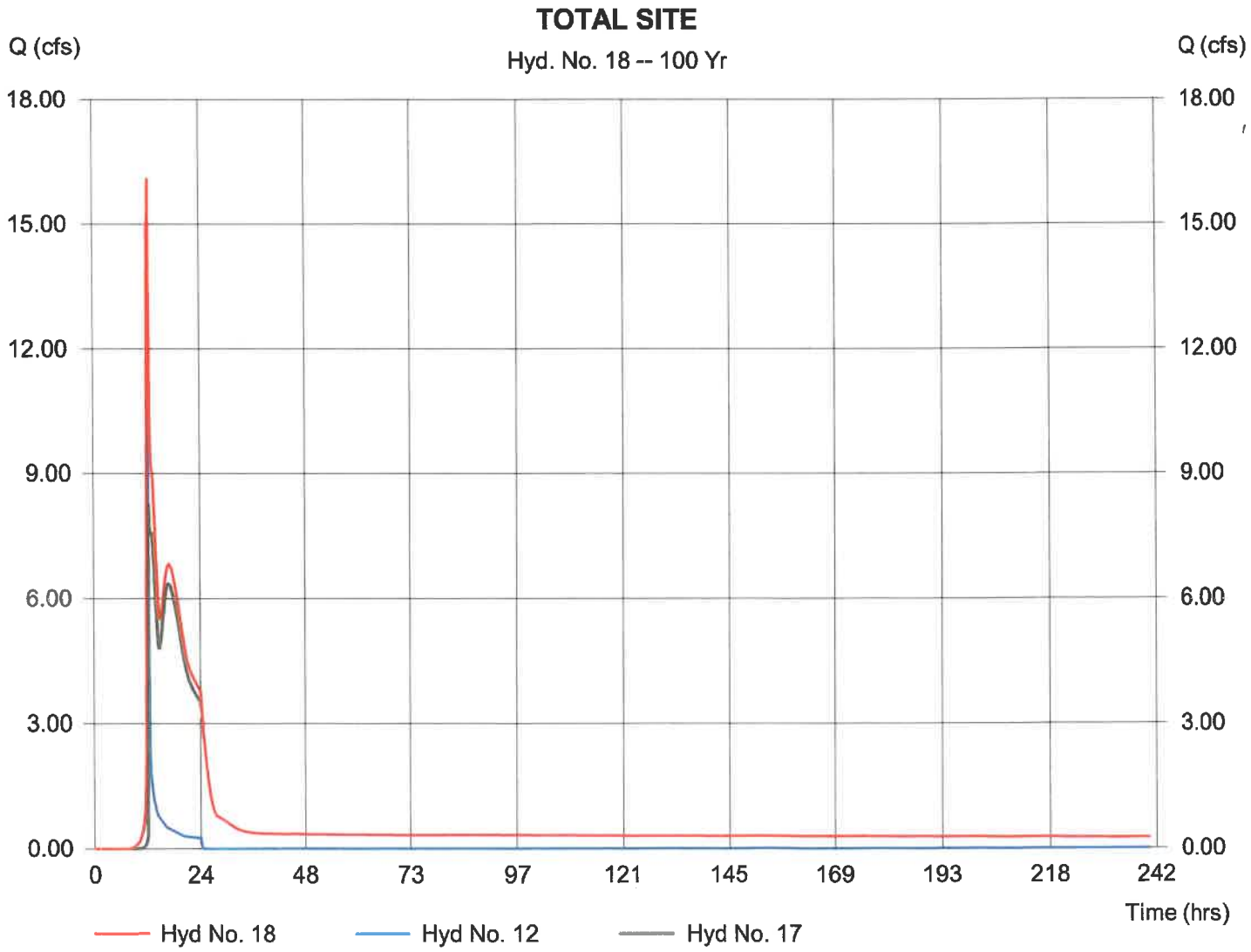
Tuesday, Dec 3 2019, 9:38 PM

Hyd. No. 18

TOTAL SITE

Hydrograph type	= Combine	Peak discharge	= 16.09 cfs
Storm frequency	= 100 yrs	Time interval	= 5 min
Inflow hyds.	= 12, 17		

Hydrograph Volume = 543,864 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

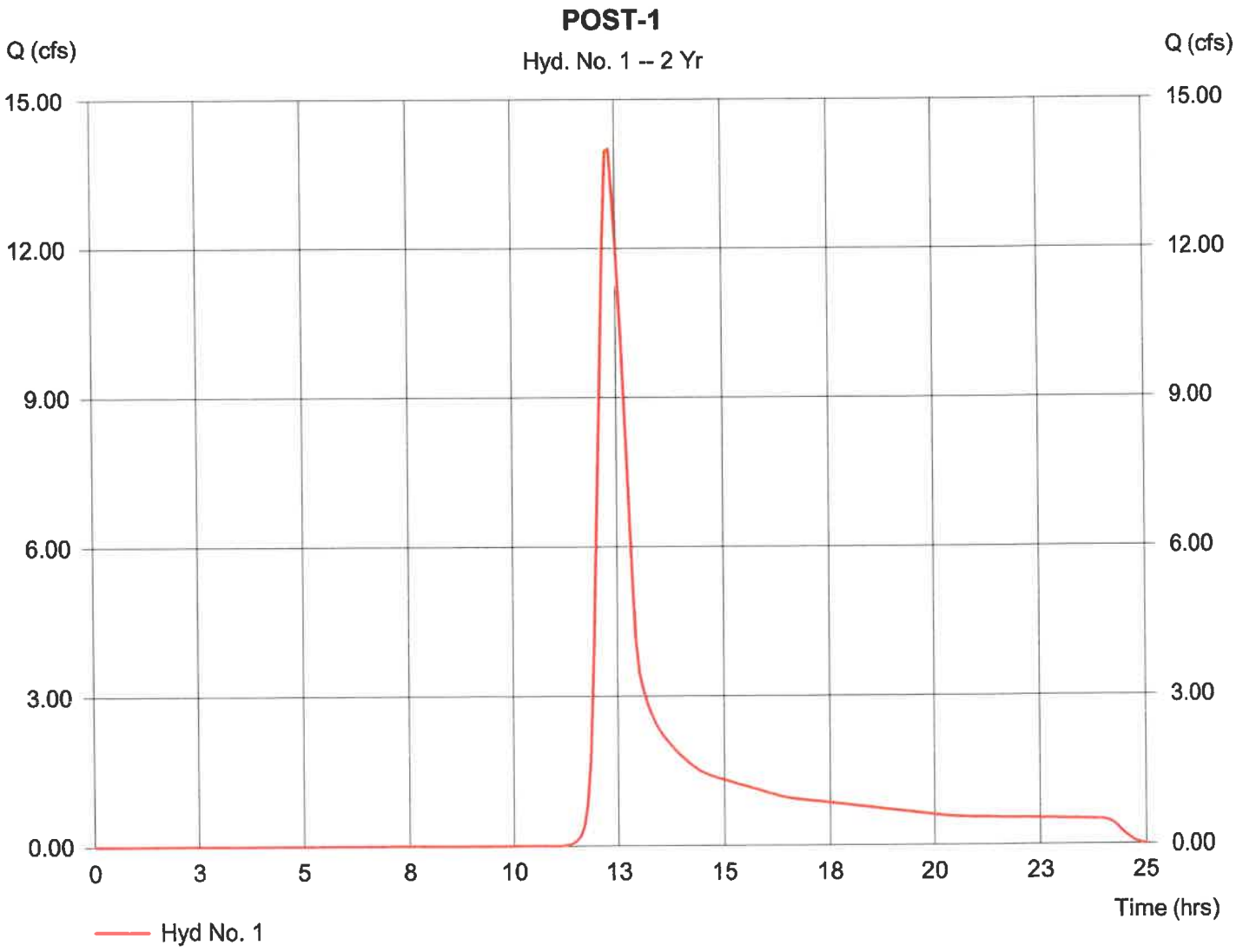
Tuesday, Dec 3 2019, 9:39 PM

Hyd. No. 1

POST-1

Hydrograph type	= SCS Runoff	Peak discharge	= 14.01 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Drainage area	= 29.70 ac	Curve number	= 78
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 35.1 min
Total precip.	= 2.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 76,088 cuft



TR55 Tc Worksheet

Hydraflow Hydrographs by Intelisolve

Hyd. No. 1

POST-1

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.240		0.011		0.011		
Flow length (ft)	= 200.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.40		0.00		0.00		
Land slope (%)	= 1.40		0.00		0.00		
Travel Time (min)	**= 33.09**	**+**	**0.00**	**+**	**0.00**	**=**	**33.09**
Shallow Concentrated Flow							
Flow length (ft)	= 0.00		0.00		0.00		
Watercourse slope (%)	= 0.00		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	= 0.00		0.00		0.00		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**
Channel Flow							
X sectional flow area (sqft)	= 5.00		0.00		0.00		
Wetted perimeter (ft)	= 21.00		0.00		0.00		
Channel slope (%)	= 0.80		0.00		0.00		
Manning's n-value	= 0.010		0.015		0.015		
Velocity (ft/s)	= 5.10		0.00		0.00		
Flow length (ft)	= 630.0		0.0		0.0		
Travel Time (min)	**= 2.06**	**+**	**0.00**	**+**	**0.00**	**=**	**2.06**

Total Travel Time, Tc ..... 35.10 min

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

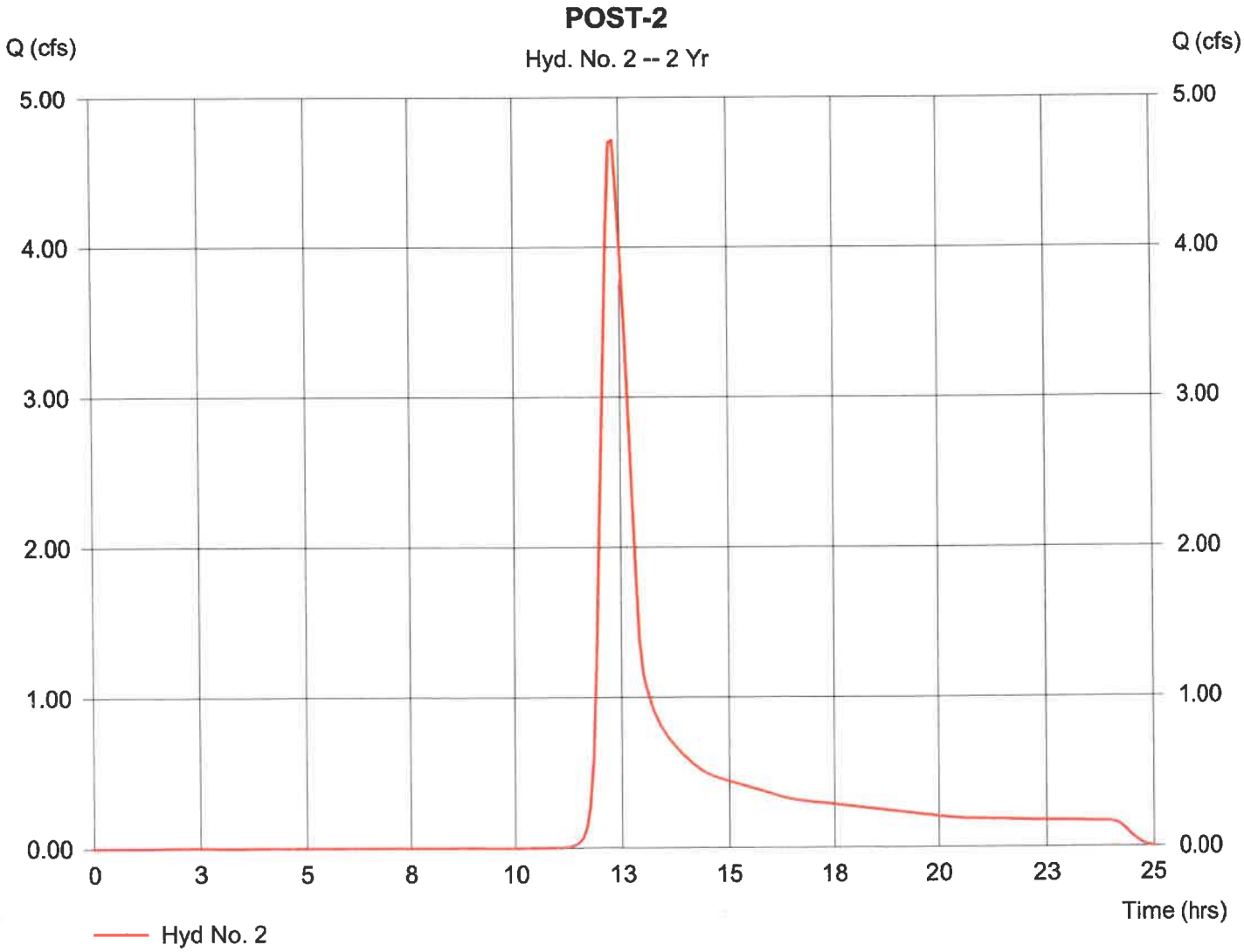
Tuesday, Dec 3 2019, 9:39 PM

Hyd. No. 2

POST-2

Hydrograph type	= SCS Runoff	Peak discharge	= 4.72 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Drainage area	= 10.00 ac	Curve number	= 78
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 39 min
Total precip.	= 2.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 25,619 cuft



TR55 Tc Worksheet

Hydraflow Hydrographs by Intelisolve

Hyd. No. 2

POST-2

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.240		0.000		0.011		
Flow length (ft)	= 200.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.40		0.00		0.00		
Land slope (%)	= 1.00		0.00		0.00		
Travel Time (min)	**= 37.86**	**+**	**0.00**	**+**	**0.00**	**=**	**37.86**
Shallow Concentrated Flow							
Flow length (ft)	= 170.00		0.00		0.00		
Watercourse slope (%)	= 2.40		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	= 2.50		0.00		0.00		
Travel Time (min)	**= 1.13**	**+**	**0.00**	**+**	**0.00**	**=**	**1.13**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.030		0.015		0.015		
Velocity (ft/s)	= 0.00		0.00		0.00		
Flow length (ft)	= 0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 39.00 min

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

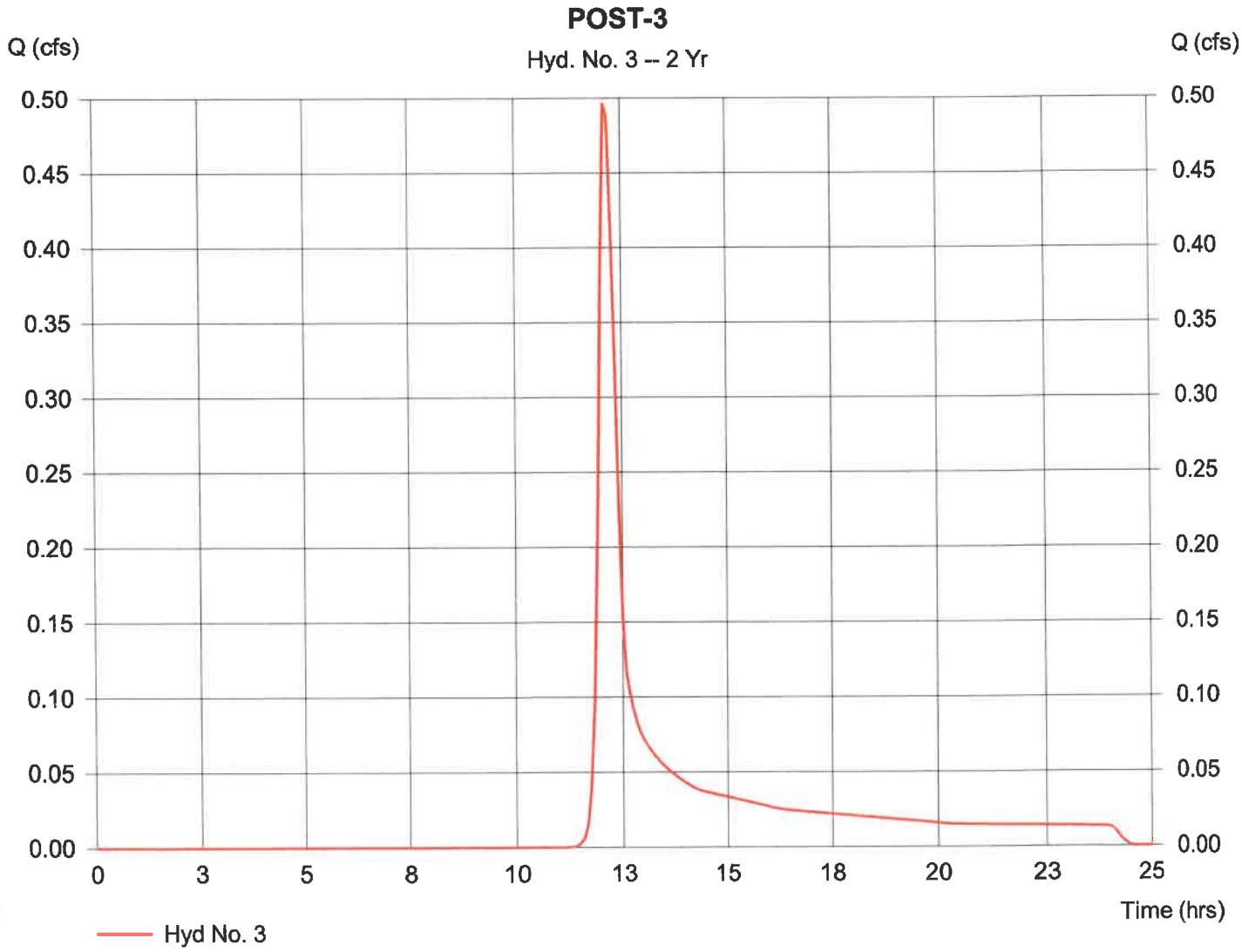
Tuesday, Dec 3 2019, 9:39 PM

Hyd. No. 3

POST-3

Hydrograph type	= SCS Runoff	Peak discharge	= 0.50 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Drainage area	= 0.80 ac	Curve number	= 77
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 21.7 min
Total precip.	= 2.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 1,970 cuft



TR55 Tc Worksheet

Hydraflow Hydrographs by Intelisolve

Hyd. No. 3

POST-3

Description	A	B	C	Totals
Sheet Flow				
Manning's n-value	= 0.240	0.011	0.011	
Flow length (ft)	= 200.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 2.40	0.00	0.00	
Land slope (%)	= 4.00	0.00	0.00	
Travel Time (min)	**= 21.74**	**+ 0.00**	**+ 0.00**	**= 21.74**
Shallow Concentrated Flow				
Flow length (ft)	= 0.00	0.00	0.00	
Watercourse slope (%)	= 0.00	0.00	0.00	
Surface description	= Paved	Paved	Paved	
Average velocity (ft/s)	= 0.00	0.00	0.00	
Travel Time (min)	**= 0.00**	**+ 0.00**	**+ 0.00**	**= 0.00**
Channel Flow				
X sectional flow area (sqft)	= 0.00	0.00	0.00	
Wetted perimeter (ft)	= 0.00	0.00	0.00	
Channel slope (%)	= 0.00	0.00	0.00	
Manning's n-value	= 0.015	0.015	0.015	
Velocity (ft/s)	= 0.00	0.00	0.00	
Flow length (ft)	= 0.0	0.0	0.0	
Travel Time (min)	**= 0.00**	**+ 0.00**	**+ 0.00**	**= 0.00**

Total Travel Time, Tc ..... 21.70 min

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

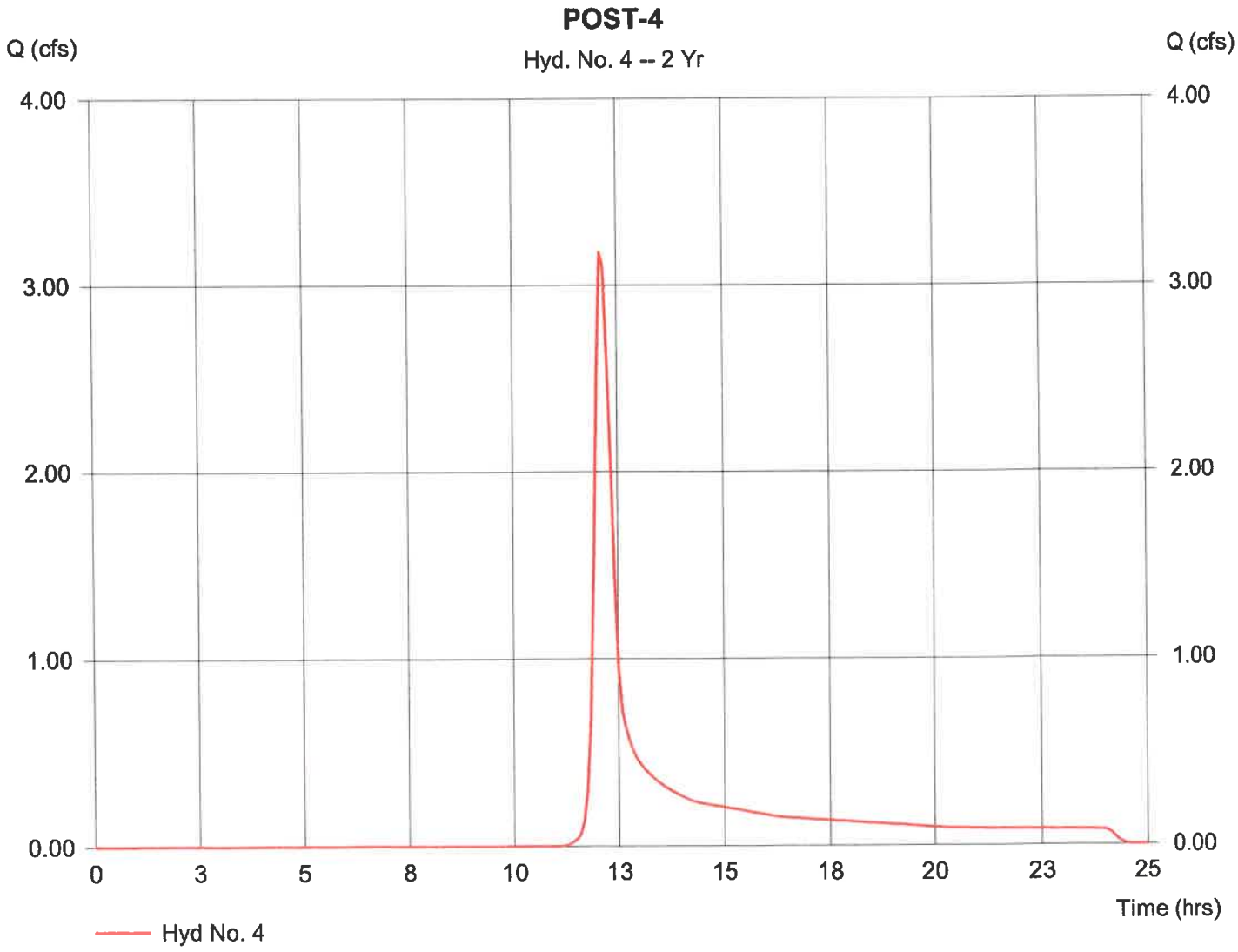
Tuesday, Dec 3 2019, 9:39 PM

Hyd. No. 4

POST-4

Hydrograph type	= SCS Runoff	Peak discharge	= 3.18 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Drainage area	= 4.70 ac	Curve number	= 78
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 23.6 min
Total precip.	= 2.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 12,350 cuft



TR55 Tc Worksheet

Hydraflow Hydrographs by Intelisolve

Hyd. No. 4

POST-4

Description	A	B	C	Totals
Sheet Flow				
Manning's n-value	= 0.240	0.011	0.011	
Flow length (ft)	= 160.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 2.40	0.00	0.00	
Land slope (%)	= 2.20	0.00	0.00	
Travel Time (min)	**= 23.10**	**+ 0.00**	**+ 0.00**	**= 23.10**
Shallow Concentrated Flow				
Flow length (ft)	= 100.00	0.00	0.00	
Watercourse slope (%)	= 4.20	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	= 3.31	0.00	0.00	
Travel Time (min)	**= 0.50**	**+ 0.00**	**+ 0.00**	**= 0.50**
Channel Flow				
X sectional flow area (sqft)	= 0.00	0.00	0.00	
Wetted perimeter (ft)	= 0.00	0.00	0.00	
Channel slope (%)	= 0.00	0.00	0.00	
Manning's n-value	= 0.015	0.015	0.015	
Velocity (ft/s)	= 0.00	0.00	0.00	
Flow length (ft)	= 0.0	0.0	0.0	
Travel Time (min)	**= 0.00**	**+ 0.00**	**+ 0.00**	**= 0.00**

Total Travel Time, Tc ..... 23.60 min

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

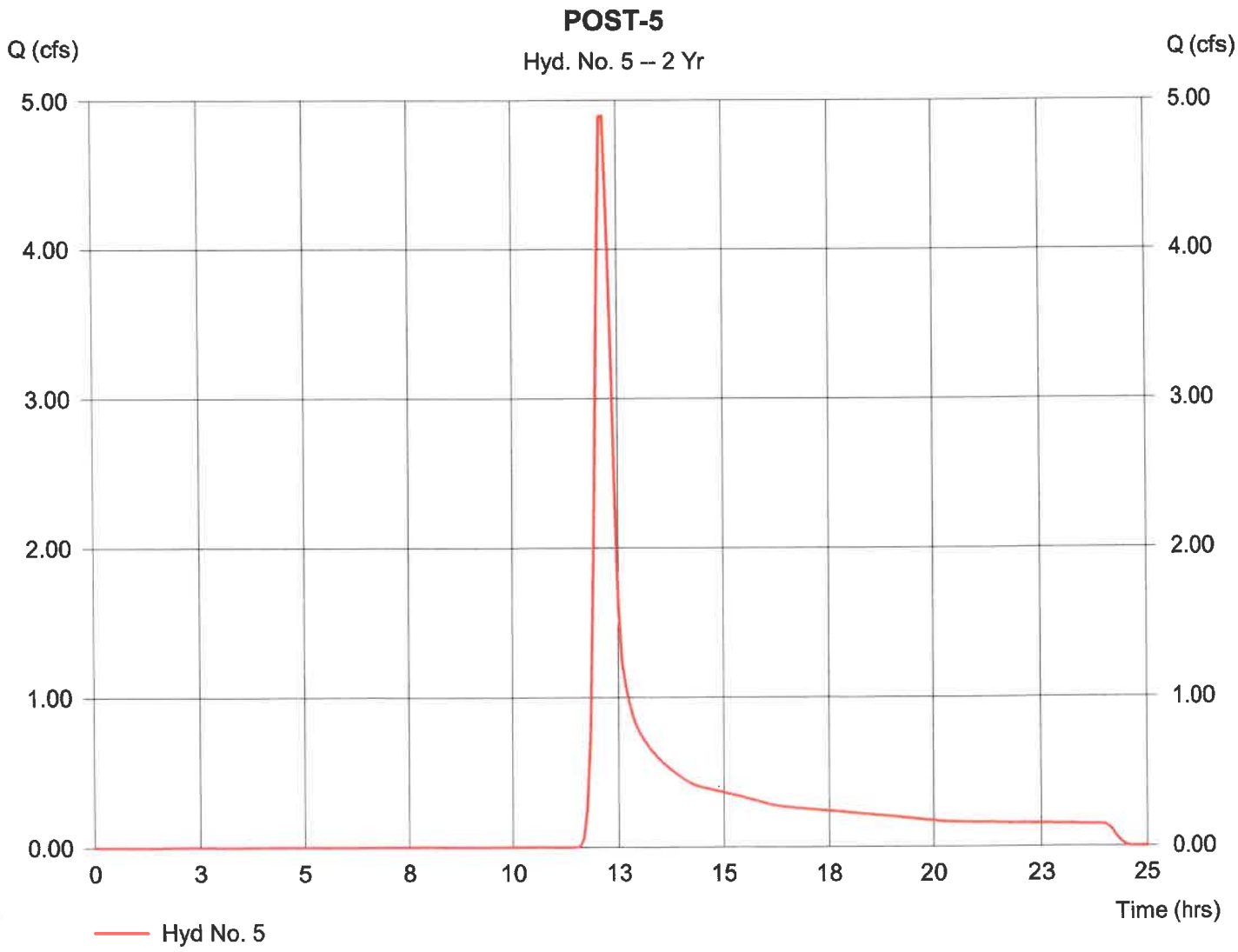
Tuesday, Dec 3 2019, 9:39 PM

Hyd. No. 5

POST-5

Hydrograph type	= SCS Runoff	Peak discharge	= 4.90 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Drainage area	= 9.50 ac	Curve number	= 75
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 22.9 min
Total precip.	= 2.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 20,448 cuft



TR55 Tc Worksheet

Hydraflow Hydrographs by Intelisolve

Hyd. No. 5

POST-5

Description	A	B	C	Totals
Sheet Flow				
Manning's n-value	= 0.240	0.000	0.011	
Flow length (ft)	= 160.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 2.40	0.00	0.00	
Land slope (%)	= 2.50	0.00	0.00	
Travel Time (min)	**= 21.95**	**+ 0.00**	**+ 0.00**	**= 21.95**
Shallow Concentrated Flow				
Flow length (ft)	= 0.00	0.00	0.00	
Watercourse slope (%)	= 0.00	0.00	0.00	
Surface description	= Paved	Paved	Paved	
Average velocity (ft/s)	= 0.00	0.00	0.00	
Travel Time (min)	**= 0.00**	**+ 0.00**	**+ 0.00**	**= 0.00**
Channel Flow				
X sectional flow area (sqft)	= 1.80	1.80	1.80	
Wetted perimeter (ft)	= 4.71	4.71	4.71	
Channel slope (%)	= 0.29	6.00	6.00	
Manning's n-value	= 0.010	0.010	0.010	
Velocity (ft/s)	= 4.21	19.16	19.16	
Flow length (ft)	= 171.0	188.0	160.0	
Travel Time (min)	**= 0.68**	**+ 0.16**	**+ 0.14**	**= 0.98**

Total Travel Time, Tc ..... 22.90 min

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

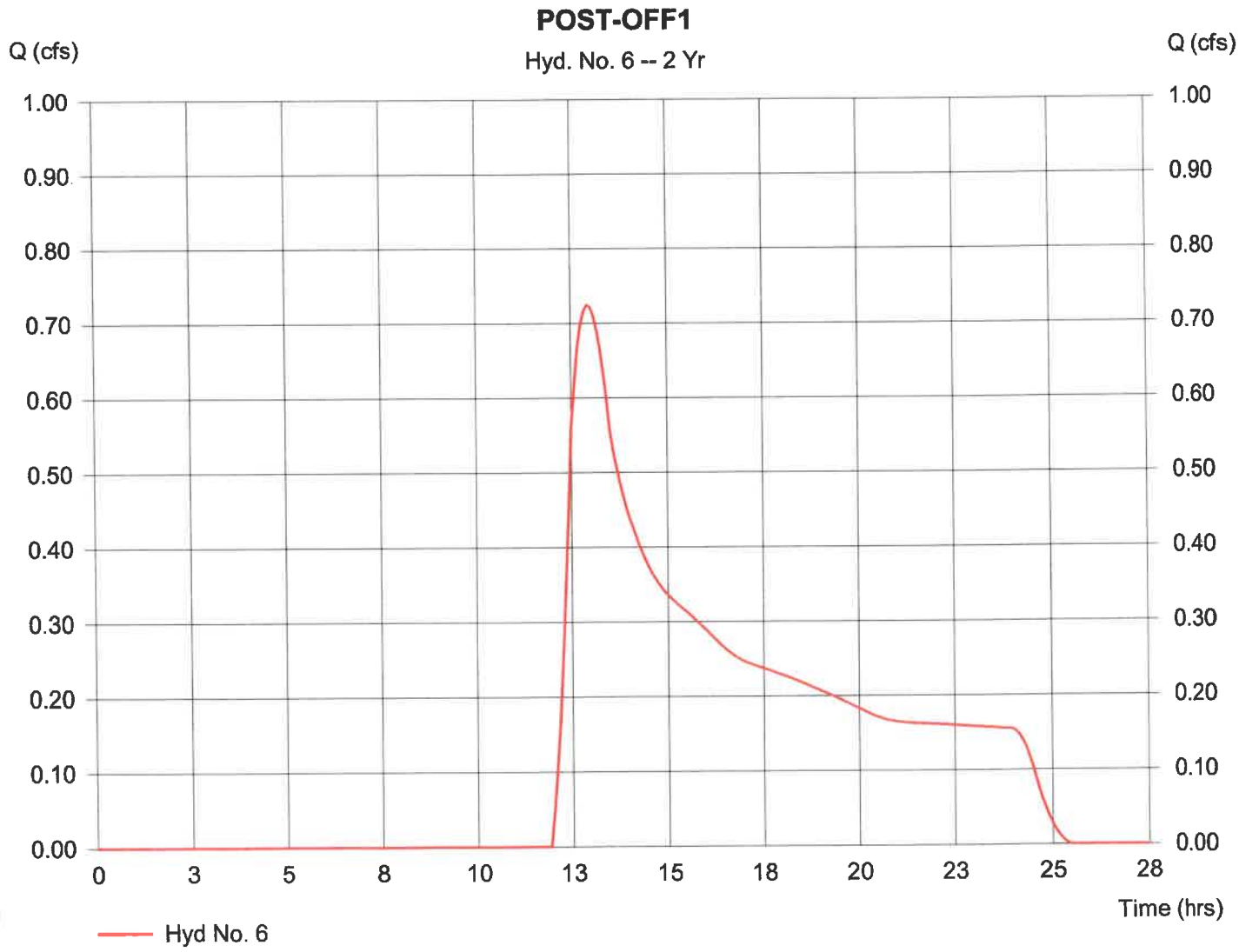
Tuesday, Dec 3 2019, 9:39 PM

Hyd. No. 6

POST-OFF1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.72 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Drainage area	= 20.30 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 51.7 min
Total precip.	= 2.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 12,277 cuft



TR55 Tc Worksheet

Hydraflow Hydrographs by Intelisolve

Hyd. No. 6

POST-OFF1

Description	A	B	C	Totals
Sheet Flow				
Manning's n-value	= 0.240	0.011	0.011	
Flow length (ft)	= 200.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 2.40	0.00	0.00	
Land slope (%)	= 0.70	0.00	0.00	
Travel Time (min)	**= 43.66**	**+ 0.00**	**+ 0.00**	**= 43.66**
Shallow Concentrated Flow				
Flow length (ft)	= 400.00	0.00	0.00	
Watercourse slope (%)	= 2.80	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	= 2.70	0.00	0.00	
Travel Time (min)	**= 2.47**	**+ 0.00**	**+ 0.00**	**= 2.47**
Channel Flow				
X sectional flow area (sqft)	= 10.00	6.00	1.80	
Wetted perimeter (ft)	= 20.00	10.00	4.71	
Channel slope (%)	= 7.00	0.70	0.26	
Manning's n-value	= 0.060	0.030	0.010	
Velocity (ft/s)	= 4.13	2.95	3.99	
Flow length (ft)	= 410.0	270.0	568.0	
Travel Time (min)	**= 1.65**	**+ 1.52**	**+ 2.37**	**= 5.55**

Total Travel Time, Tc ..... 51.70 min

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

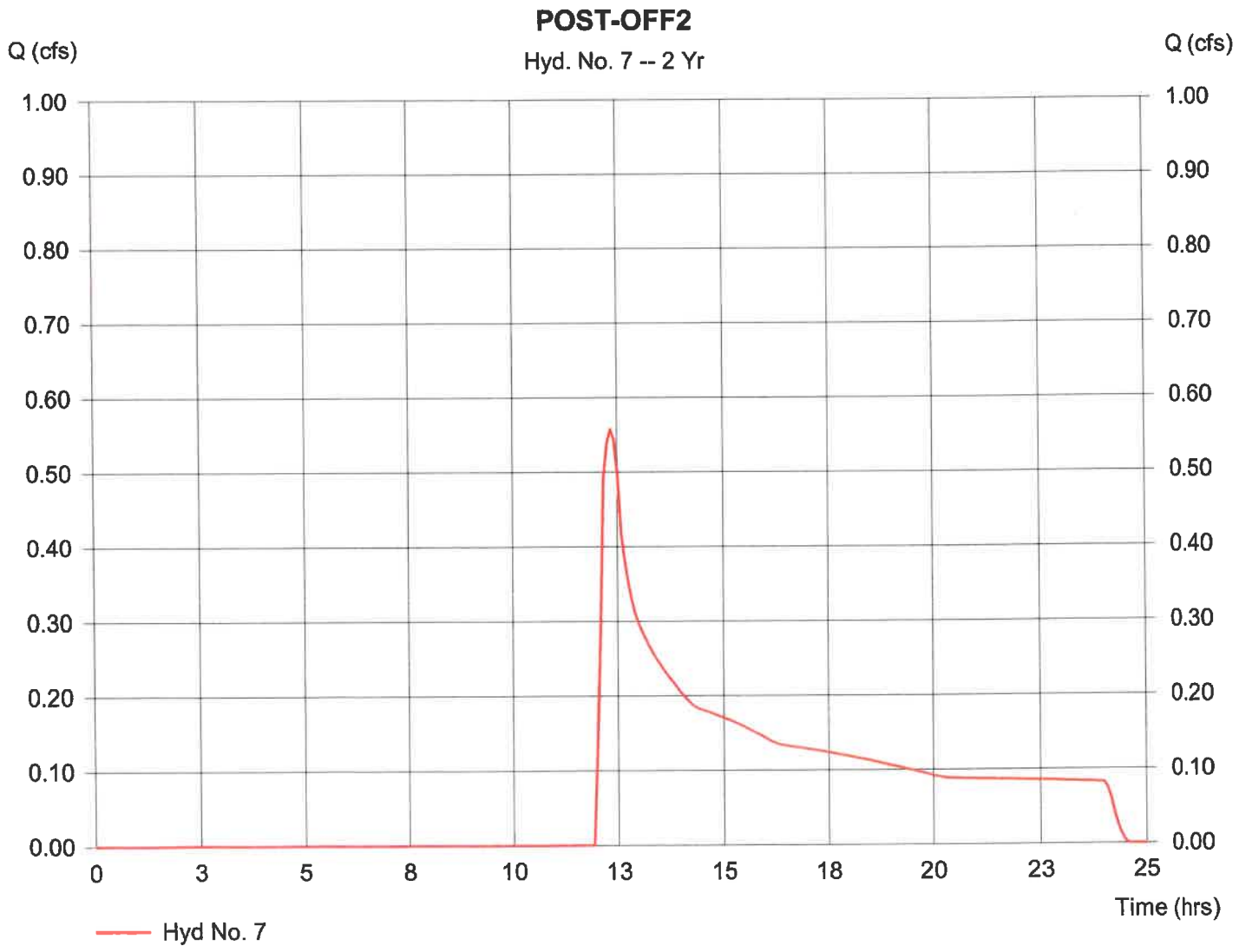
Tuesday, Dec 3 2019, 9:39 PM

Hyd. No. 7

POST-OFF2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.56 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Drainage area	= 11.10 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 22.8 min
Total precip.	= 2.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 6,595 cuft



TR55 Tc Worksheet

Hydraflow Hydrographs by Intelisolve

Hyd. No. 7

POST-OFF2

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.240		0.011		0.011		
Flow length (ft)	= 200.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.40		0.00		0.00		
Land slope (%)	= 4.25		0.00		0.00		
Travel Time (min)	**= 21.22**	**+**	**0.00**	**+**	**0.00**	**=**	**21.22**
Shallow Concentrated Flow							
Flow length (ft)	= 290.00		0.00		0.00		
Watercourse slope (%)	= 11.60		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	= 5.50		0.00		0.00		
Travel Time (min)	**= 0.88**	**+**	**0.00**	**+**	**0.00**	**=**	**0.88**
Channel Flow							
X sectional flow area (sqft)	= 6.00		0.00		0.00		
Wetted perimeter (ft)	= 10.00		0.00		0.00		
Channel slope (%)	= 1.70		0.00		0.00		
Manning's n-value	= 0.030		0.015		0.015		
Velocity (ft/s)	= 4.60		0.00		0.00		
Flow length (ft)	= 180.0		0.0		0.0		
Travel Time (min)	**= 0.65**	**+**	**0.00**	**+**	**0.00**	**=**	**0.65**

Total Travel Time, Tc ..... 22.80 min

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

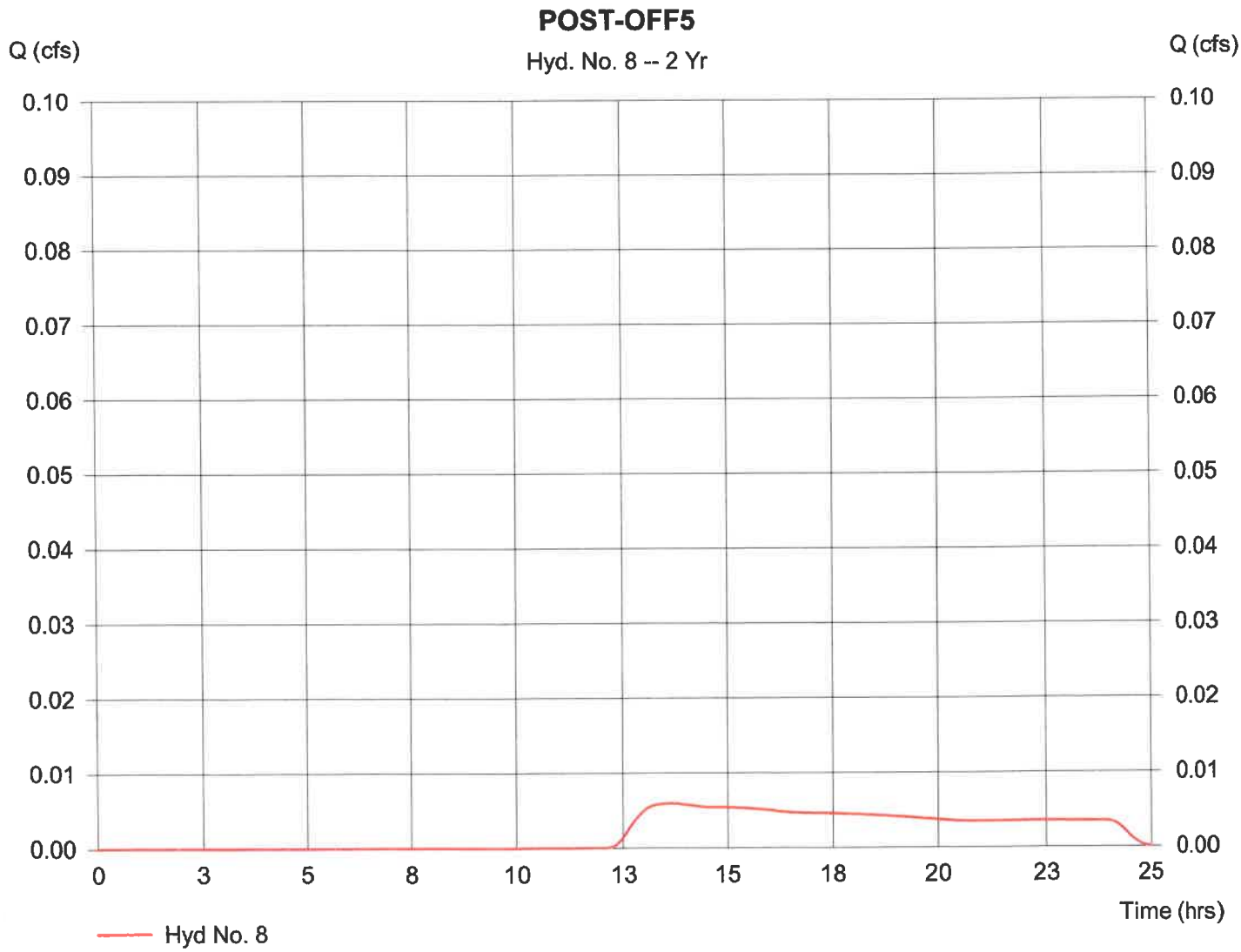
Tuesday, Dec 3 2019, 9:39 PM

Hyd. No. 8

POST-OFF5

Hydrograph type	= SCS Runoff	Peak discharge	= 0.01 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Drainage area	= 0.80 ac	Curve number	= 55
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 39.1 min
Total precip.	= 2.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 185 cuft



TR55 Tc Worksheet

Hydraflow Hydrographs by Intelisolve

Hyd. No. 8

POST-OFF5

Description	A	B	C	Totals
Sheet Flow				
Manning's n-value	= 0.400	0.011	0.011	
Flow length (ft)	= 200.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 2.40	0.00	0.00	
Land slope (%)	= 3.50	0.00	0.00	
Travel Time (min)	**= 34.51**	**+ 0.00**	**+ 0.00**	**= 34.51**
Shallow Concentrated Flow				
Flow length (ft)	= 150.00	110.00	100.00	
Watercourse slope (%)	= 0.67	2.90	1.00	
Surface description	= Unpaved	Unpaved	Unpaved	
Average velocity (ft/s)	= 1.32	2.75	1.61	
Travel Time (min)	**= 1.89**	**+ 0.67**	**+ 1.03**	**= 3.59**
Channel Flow				
X sectional flow area (sqft)	= 5.00	1.80	1.80	
Wetted perimeter (ft)	= 21.00	4.71	4.71	
Channel slope (%)	= 0.65	6.00	6.00	
Manning's n-value	= 0.010	0.010	0.010	
Velocity (ft/s)	= 4.59	19.16	19.16	
Flow length (ft)	= 200.0	188.0	160.0	
Travel Time (min)	**= 0.73**	**+ 0.16**	**+ 0.14**	**= 1.03**

Total Travel Time, Tc ..... 39.10 min

SECTION #6

Water Quality Analysis

SLAMM for Windows Version 10.4.0
(c) Copyright Robert Pitt and John Voorhees 2012
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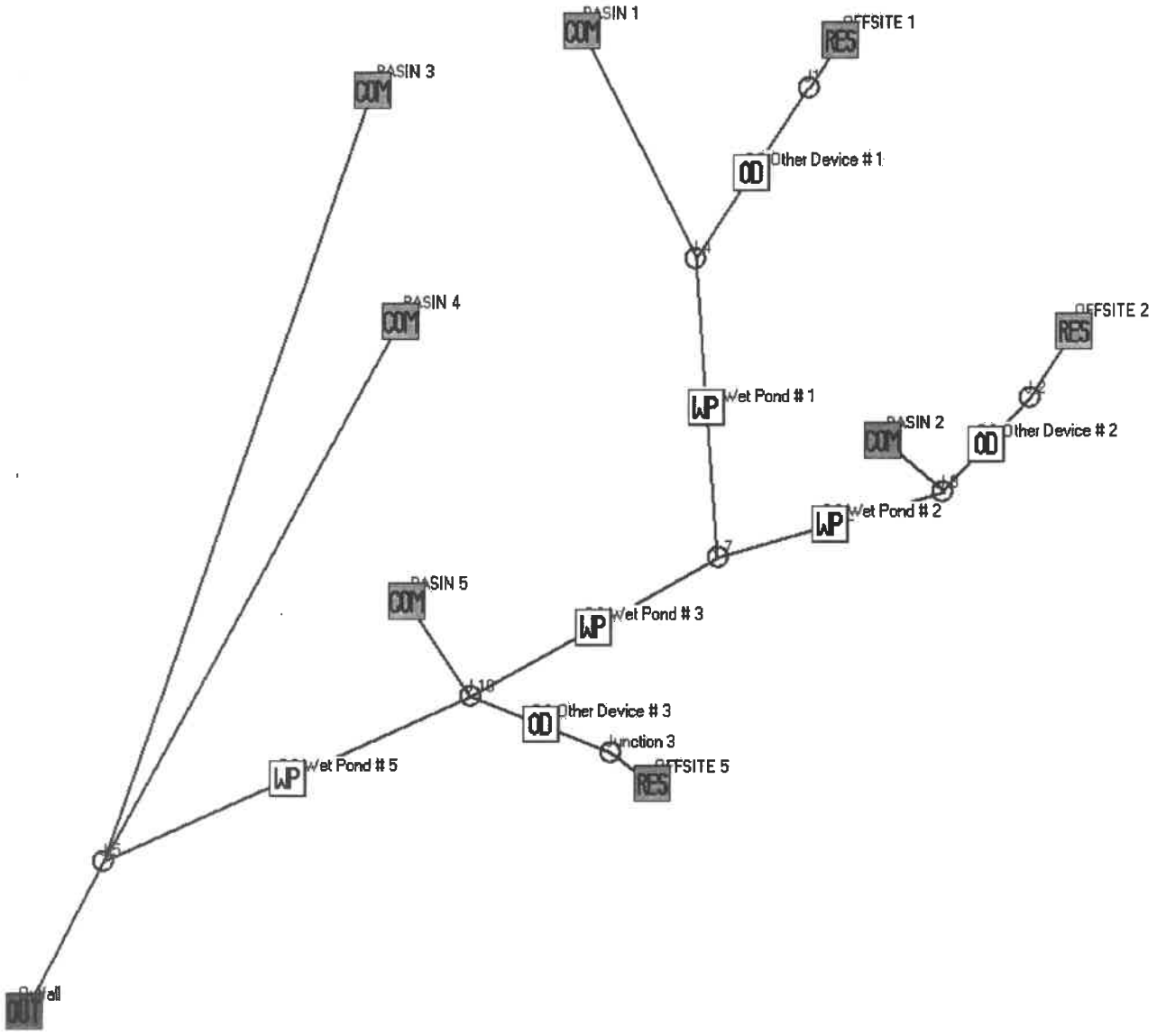
Data file name: Y:\Admin. Projects\22000\22061 Quarry Bluff SLAMM\22061 Quarry Bluff REV.mdb
Data file description:
Rain file name: C:\Program Files (x86)\WinSLAMM v10\Rain Files\WisReg - Green Bay WI 1969.RAN
Particulate Solids Concentration file name: C:\WinSLAMM Files\v10.1 WI_AVG01.pscx
Runoff Coefficient file name: C:\WinSLAMM Files\WI_SL06 Dec06.rsvx
Residential Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Institutional Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Commercial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Industrial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Other Urban Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Freeway Street Delivery file name: C:\WinSLAMM Files\Freeway Dec06.std
Pollutant Relative Concentration file name: C:\WinSLAMM Files\WI_GEO03.ppdx
Start of Winter Season: 11/25 End of Winter Season: 03/29
Model Run Start Date: 01/02/69 Model Run End Date: 12/28/69
Date of run: 12-03-2019 Time of run: 14:51:07
Total Area Modeled (acres): 86.900
Years in Model Run: 0.99

	Runoff Volume (cu ft)	Percent Runoff Volume Reduction	Particulate Solids Conc. (mg/L)	Particulate Solids Yield (lbs)	Percent Particulate Solids Reduction
Total of all Land Uses without Controls:	3.588E+06	-	185.2	41482	
Outfall Total with Controls:	3.591E+06	-0.08%	36.81	8252	80.11%
Annualized Total After Outfall Controls:	3.641E+06			8366	

> 80%


SIN 1
FFSITE 1
SIN 3
Other Device # 1
SIN 4
FFSITE 2
Wet Pond # 1
SIN 2
Other Device # 2
Wet Pond # 2
SIN 5
Wet Pond # 3
Other Device # 3
Junction 3
Wet Pond # 5
FFSITE 5
all

Data file name: Y:\Admin. Projects\22000\22061 Quarry Bluff SLAMM\22061 Quarry Bluff REV.mdb
WinSLAMM Version 10.4.0
Rain file name: C:\Program Files (x86)\WinSLAMM v10\Rain Files\WisReg - Green Bay WI 1969.RAN
Particulate Solids Concentration file name: C:\WinSLAMM Files\v10.1 WI_AVG01.pscx
Runoff Coefficient file name: C:\WinSLAMM Files\WI_SL06 Dec06.rsvx
Residential Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Institutional Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
C ercial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
I ial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Other Urban Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Freeway Street Delivery file name: C:\WinSLAMM Files\Freeway Dec06.std
Apply Street Delivery Files to Adjust the After Event Load Street Dirt Mass Balance: False
Pollutant Relative Concentration file name: C:\WinSLAMM Files\WI_GEO03.ppdx
Source Area PSD and Peak to Average Flow Ratio File: C:\WinSLAMM Files\NURP Source Area PSD Files.csv
Cost Data file name:
If Other Device Pollutant Load Reduction Values = 1, Off-site Pollutant Loads are Removed from Pollutant Load % Reduction calculations
Seed for random number generator: -42
Study period starting date: 01/02/69 Study period ending date: 12/28/69
Start of Winter Season: 11/25 End of Winter Season: 03/29
Date: 12-03-2019 Time: 14:50:44
Site information:

LU# 1 - Residential: OFFSITE 1 Total area (ac): 20.300
1 - Roofs 1: 1.400 ac. Pitched Disconnected Moderately Compacted Sandy Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
25 - Driveways 1: 1.400 ac. Disconnected Moderately Compacted Sandy Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
45 - Large Landscaped Areas 1: 0.900 ac. Moderately Compacted Sandy Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
57 - Undeveloped Areas 1: 16.600 ac. Normal Sandy Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 2 - Residential: OFFSITE 2 Total area (ac): 11.100
1 - Roofs 1: 0.700 ac. Pitched Disconnected Moderately Compacted Sandy Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
25 - Driveways 1: 0.700 ac. Disconnected Moderately Compacted Sandy Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
45 - Large Landscaped Areas 1: 0.700 ac. Moderately Compacted Sandy Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
57 - Undeveloped Areas 1: 9.000 ac. Normal Sandy Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 3 - Commercial: BASIN 1 Total area (ac): 29.700
1 - Roofs 1: 3.200 ac. Pitched Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
2 - Roofs 2: 0.200 ac. Pitched Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
3 - Roofs 3: 0.200 ac. Pitched Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
4 - Roofs 4: 0.100 ac. Pitched Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
13 - Paved Parking 1: 0.460 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
25 - Driveways 1: 2.720 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
6 - Driveways 2: 0.100 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
7 - Streets 1: 1.790 ac. Intermediate Street Length = 1.169 curb-mi Street Width (assuming two curb-mi per street mile) = 25.26518 ft
Default St. Dirt Accum. Annual Winter Load = 2500 lbs Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
45 - Large Landscaped Areas 1: 17.390 ac. Moderately Compacted Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
46 - Large Landscaped Areas 2: 0.500 ac. Moderately Compacted Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
47 - Large Landscaped Areas 3: 1.000 ac. Moderately Compacted Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
70 - Water Body Areas: 2.040 ac. Source Area PSD File:

LU# 4 - Residential: OFFSITE 5 Total area (ac): 0.800
57 - Undeveloped Areas 1: 0.800 ac. Normal Sandy Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 5 - Commercial: BASIN 2 Total area (ac): 10.000
1 - Roofs 1: 0.600 ac. Pitched Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
2 - Roofs 2: 0.400 ac. Pitched Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
13 - Paved Parking 1: 0.040 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
25 - Driveways 1: 0.480 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
37 - Streets 1: 1.450 ac. Intermediate Street Length = 0.342 curb-mi Street Width (assuming two curb-mi per street mile) = 69.95614 ft
Default St. Dirt Accum. Annual Winter Load = 2500 lbs Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
38 - Streets 2: 0.300 ac. Intermediate Street Length = 0.206 curb-mi Street Width (assuming two curb-mi per street mile) = 24.02913 ft
Default St. Dirt Accum. Annual Winter Load = 2500 lbs Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
45 - Large Landscaped Areas 1: 5.880 ac. Moderately Compacted Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
46 - Large Landscaped Areas 2: 0.050 ac. Moderately Compacted Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
70 - Water Body Areas: 0.800 ac. Source Area PSD File:

LU# 6 - Commercial: BASIN 3 Total area (ac): 0.800
1 - Roofs 1: 0.200 ac. Pitched Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
45 - Large Landscaped Areas 1: 0.600 ac. Moderately Compacted Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 7 - Commercial: BASIN 4 Total area (ac): 4.700
1 - Roofs 1: 0.700 ac. Pitched Disconnected Moderately Compacted Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
25 - Driveways 1: 0.100 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
31 - Sidewalks 1: 0.200 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
45 - Large Landscaped Areas 1: 3.200 ac. Moderately Compacted Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
63 - Paved Playground 1: 0.500 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

- Commercial: BASIN 5 Total area (ac): 9.500
1 - Roofs 1: 0.200 ac. Pitched Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
13 - Paved Parking 1: 0.100 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
25 - Driveways 1: 0.100 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
37 - Streets 1: 1.600 ac. Intermediate Street Length = 1.1 curb-mi Street Width (assuming two curb-mi per street mile) = 24 ft
Default St. Dirt Accum. Annual Winter Load = 2500 lbs Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
45 - Large Landscaped Areas 1: 7.240 ac. Moderately Compacted Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
70 - Water Body Areas: 0.260 ac. Source Area PSD File:

Control Practice 1: Other Device CP# 1 (DS) - DS Other Device # 1
Fraction of drainage area served by device (ac) = 1.00
Particulate Concentration reduction fraction = 1.00
Filterable Concentration reduction fraction = 1.00
Runoff volume reduction fraction = 0
Control Practice 2: Other Device CP# 2 (DS) - DS Other Device # 2
Fraction of drainage area served by device (ac) = 1.00
Particulate Concentration reduction fraction = 1.00
Filterable Concentration reduction fraction = 1.00
Runoff volume reduction fraction = 0
Control Practice 3: Other Device CP# 3 (DS) - DS Other Device # 3
Fraction of drainage area served by device (ac) = 1.00
Particulate Concentration reduction fraction = 1.00
Filterable Concentration reduction fraction = 1.00
Runoff volume reduction fraction = 0
Control Practice 4: Wet Detention Pond CP# 1 (DS) - DS Wet Pond # 1
Particle Size Distribution file name: Not needed - calculated by program
Initial stage elevation (ft): 5
Peak to Average Flow Ratio: 3.8
Maximum flow allowed into pond (cfs): No maximum value entered
Outlet Characteristics:
Outlet type: Orifice 1
1. Orifice diameter (ft): 0.25
2. Number of orifices: 1
3. Invert elevation above datum (ft): 5
Outlet type: Broad Crested Weir
1. Weir crest length (ft): 10
2. Weir crest width (ft): 10
3. Height from datum to bottom of weir opening: 7.9
Outlet type: Vertical Stand Pipe
1. Stand pipe diameter (ft): 4
2. Stand pipe height above datum (ft): 7.75
Pond stage and surface area

Entry Number	Stage (ft)	Pond Area (acres)	Natural Seepage (in/hr)	Other Outflow (cfs)
0	0.00	0.0000	0.00	0.00
1	0.01	0.9200	0.00	0.00
2	1.00	1.0400	0.00	0.00
3	2.00	1.1700	0.00	0.00
4	3.00	1.2900	0.00	0.00
5	3.50	1.3500	0.00	0.00
6	4.00	1.5600	0.00	0.00
7	4.50	1.7700	0.00	0.00
8	5.00	1.8600	0.00	0.00
9	6.00	2.0400	0.00	0.00
10	7.00	2.2200	0.00	0.00
11	8.00	2.4200	0.00	0.00

Control Practice 5: Wet Detention Pond CP# 2 (DS) - DS Wet Pond # 2
Particle Size Distribution file name: Not needed - calculated by program
Initial stage elevation (ft): 5
Peak to Average Flow Ratio: 3.8
Maximum flow allowed into pond (cfs): No maximum value entered
Outlet Characteristics:
Outlet type: Broad Crested Weir
1. Weir crest length (ft): 10
2. Weir crest width (ft): 10
3. Height from datum to bottom of weir opening: 5
Pond stage and surface area

Entry Number	Stage (ft)	Pond Area (acres)	Natural Seepage (in/hr)	Other Outflow (cfs)
0	0.00	0.0000	0.00	0.00
1	0.01	0.1100	0.00	0.00
2	1.00	0.1300	0.00	0.00
3	2.00	0.1500	0.00	0.00
4	3.00	0.1700	0.00	0.00
5	3.50	0.1800	0.00	0.00
6	4.50	0.3200	0.00	0.00
7	5.00	0.3700	0.00	0.00
8	6.00	0.4500	0.00	0.00
9	6.75	0.5200	0.00	0.00

Control Practice 6: Wet Detention Pond CP# 3 (DS) - DS Wet Pond # 3
Particle Size Distribution file name: Not needed - calculated by program
Initial stage elevation (ft): 5.5
Peak to Average Flow Ratio: 3.8
Maximum flow allowed into pond (cfs): No maximum value entered
Outlet Characteristics:
Outlet type: Orifice 1
1. Orifice diameter (ft): 0.25
2. Number of orifices: 1
3. Invert elevation above datum (ft): 5.5
Outlet type: Broad Crested Weir
1. Weir crest length (ft): 10
2. Weir crest width (ft): 10
3. Height from datum to bottom of weir opening: 7.5
Outlet type: Vertical Stand Pipe

1. Stand pipe diameter (ft): 4
2. Stand pipe height above datum (ft): 7.25

Pond stage and surface area

Entry Number	Stage (ft)	Pond Area (acres)	Natural Seepage (in/hr)	Other Outflow (cfs)
0	0.00	0.0000	0.00	0.00
1	0.01	0.1300	0.00	0.00
2	1.00	0.1600	0.00	0.00
3	2.00	0.1900	0.00	0.00
4	3.00	0.2300	0.00	0.00
5	4.00	0.2600	0.00	0.00
6	5.00	0.4000	0.00	0.00
7	5.50	0.4300	0.00	0.00
8	6.00	0.4800	0.00	0.00
9	7.00	0.5600	0.00	0.00
10	7.75	0.6300	0.00	0.00

Control Practice 7: Wet Detention Pond CP# 4 (DS) - DS Wet Pond # 5

Particle Size Distribution file name: Not needed - calculated by program

Initial stage elevation (ft): 5

Peak to Average Flow Ratio: 3.8

Maximum flow allowed into pond (cfs): No maximum value entered

Outlet Characteristics:

Outlet type: Orifice 1

1. Orifice diameter (ft): 0.25
2. Number of orifices: 1
3. Invert elevation above datum (ft): 5

Outlet type: Broad Crested Weir

1. Weir crest length (ft): 10
2. Weir crest width (ft): 10
3. Height from datum to bottom of weir opening: 7.75

Outlet type: Vertical Stand Pipe

1. Stand pipe diameter (ft): 4
2. Stand pipe height above datum (ft): 7.25

Pond stage and surface area

Entry Number	Stage (ft)	Pond Area (acres)	Natural Seepage (in/hr)	Other Outflow (cfs)
0	0.00	0.0000	0.00	0.00
1	0.01	0.0700	0.00	0.00
2	1.00	0.0900	0.00	0.00
3	2.00	0.1000	0.00	0.00
4	3.00	0.1200	0.00	0.00
5	3.50	0.1300	0.00	0.00
6	4.50	0.2400	0.00	0.00
7	5.00	0.2600	0.00	0.00
8	6.00	0.2900	0.00	0.00
9	7.00	0.3300	0.00	0.00
10	8.00	0.3700	0.00	0.00

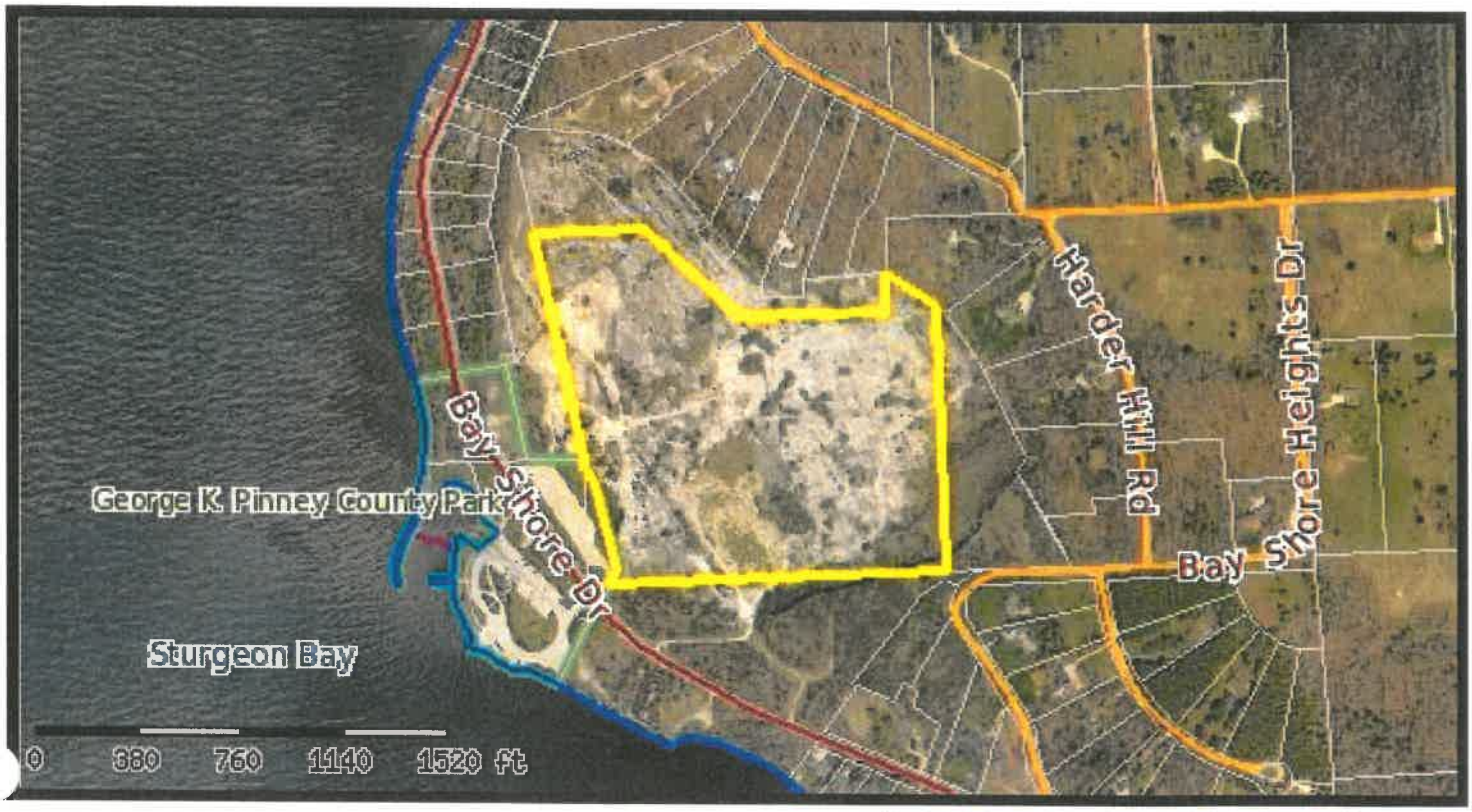
SECTION #7

Reference Materials

Tax Parcel Report

Courtesy of the Door County Land Information Office

... from the Web Map of ...
(//www.co.door.wi.gov)
Door County, Wisconsin
... for all seasons!



May 2019 Orthophoto as default backdrop

Door County can not and does not make any representation regarding the accuracy or completeness, nor the error-free nature, of information depicted on this map. This information is provided to users "as is". The user of this information assumes any and all risks associated with this information. Door County makes no warranty or representation, either express or implied, as to the accuracy, completeness, or fitness for a particular purpose of this information. The Web Map is only a compilation of information and is NOT to be considered a legally recorded map or a legal land survey to be relied upon.

Data Current through 7th June 2019

Parcel Number: 0220113282511 - TOWN OF SEVASTOPOL
PLSS Section-Town-Range: NE 1/4 of NE 1/4 13-28-25
Property Address: 0

Owner Name: MARGARET DREUTZER
Mailing Address:
4883 HARDER HILL RD
STURGEON BAY, WI 54235

Legal Description:
FRACTIONAL SEC 13-28-25N OF
COM NE COR SEC 12 S1324'BG
S38DW1011'TO SHR GREEN BAY
SUBJ TO EASEMENT 371-658 &
EXC PARCELS SOLD OFF & TRCT
more legal not shown

Other Owners:

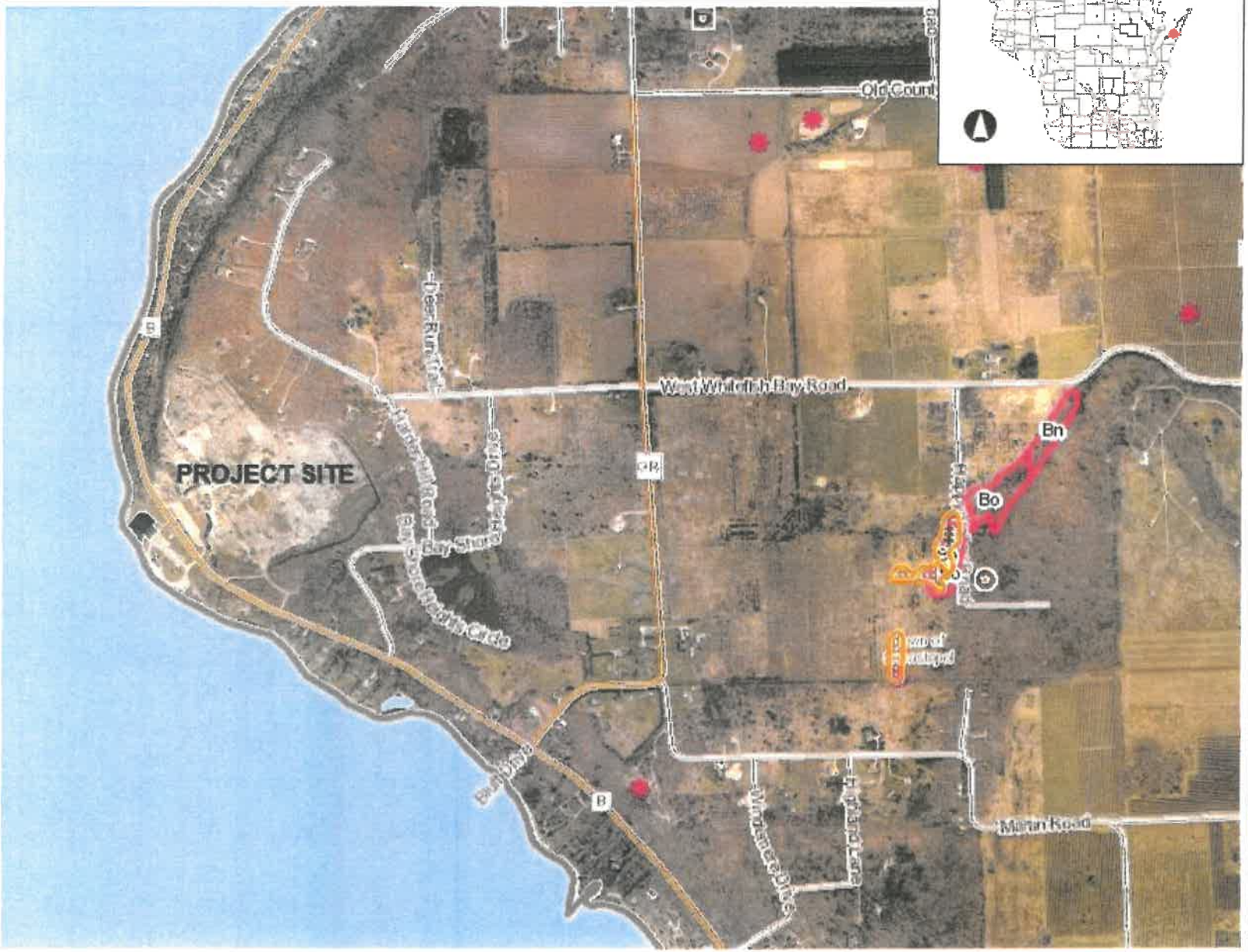
Recorded Doc: DOC# 746899, 714335

School District: SEV

Valuations: 2019
Acres: 24.52
Land Value: $37900
Improved Value: $0
Forest Value: $0

Taxes: 2018
Real Estate Tax: $405.69
Special Tax: $0.00
Forest Tax: $0.00
Est Fair Market Val: $38000

Surface Water Data Viewer Map



Legend

- Wetland Identifications and Confirmations
  - Wetland Class Points
    - Dammed pond
    - Excavated pond
    - Filled excavated pond
    - Filled/drained wetland
    - Wetland too small to delineate
  - Filled Points
  - Wetland Class Areas
    - Wetland
    - Upland
  - Filled Areas
- Filled Areas
  - Wetland Class Points
    - Dammed pond
    - Excavated pond
    - Filled excavated pond
    - Filled/drained wetland
    - Wetland too small to delineate
  - Filled Points
  - Wetland Class Areas
    - Wetland
    - Upland
  - Filled Areas
- NRCS Wetspots
- Maximum Extent Wetland Indicators
- Minimum Extent Wetland Indicators
- Municipality
- State Boundaries
- County Boundaries
- Major Roads
  - Interstate Highway
  - State Highway

Notes

Quarry Bluff, LLC

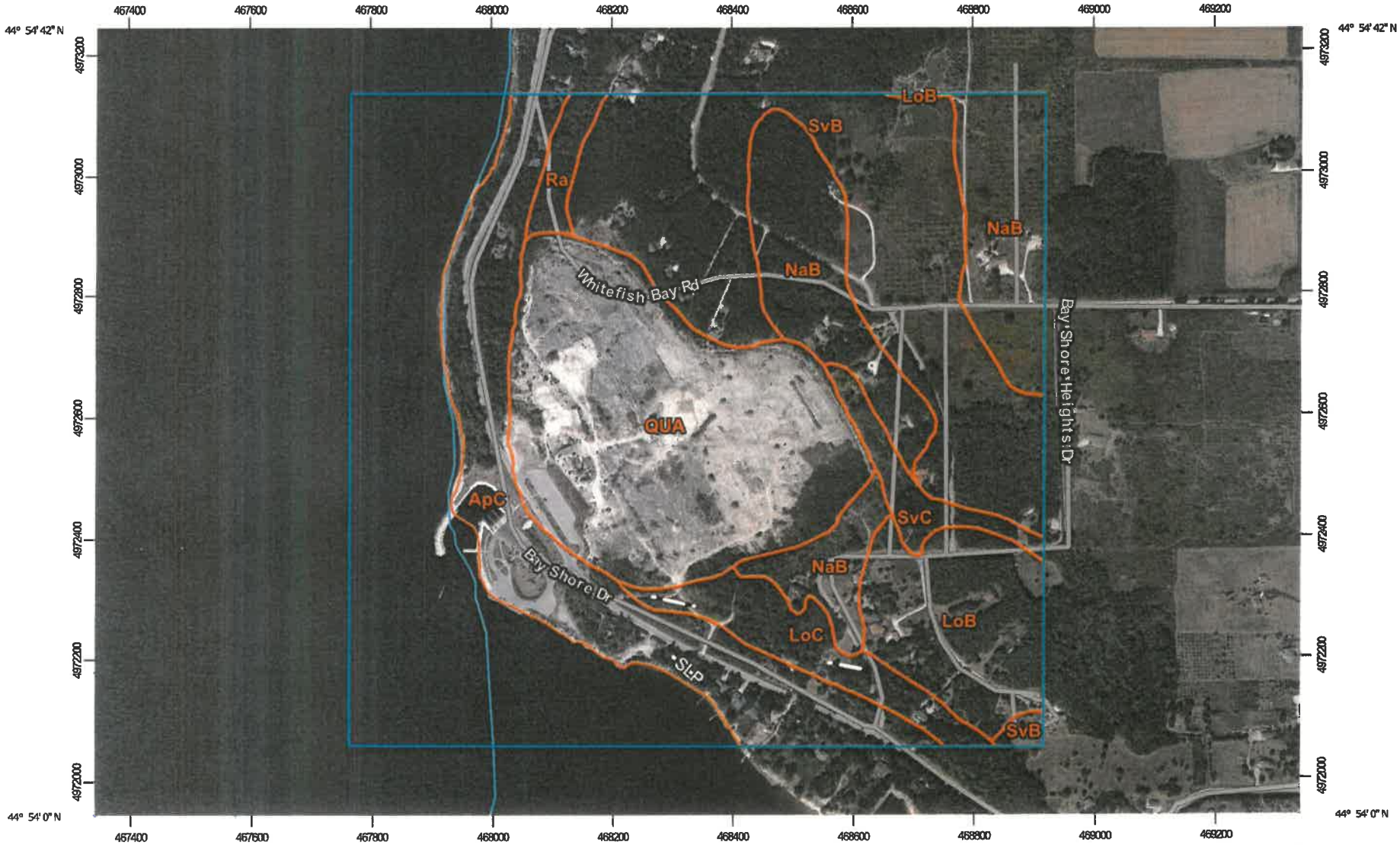
0.5 0 0.25 0.5 Miles

NAD_1983_HARN_Wisconsin_TM

1: 15,840

DISCLAIMER: The information shown on these maps has been obtained from various sources, and are of varying age, reliability and resolution. These maps are not intended to be used for navigation, nor are these maps an authoritative source of information about legal land ownership or public access. No warranty, expressed or implied, is made regarding accuracy, applicability for a particular use, completeness, or legality of the information depicted on this map. For more information, see the DNR Legal Notices web page: http://dnr.wi.gov/legal/

Soil Map—Door County, Wisconsin
(Quarry Bluff, LLC)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Door County, Wisconsin
Survey Area Data: Version 14, Sep 12, 2018

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

Date(s) aerial images were photographed: Sep 9, 2011—Sep 10, 2011

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
ApC	Alpena gravelly sandy loam, 0 to 12 percent slopes	40.2	13.0%
LoB	Longrie Loam, 2 to 6 percent slopes	20.5	6.6%
LoC	Longrie Loam, 6 to 12 percent slopes	10.8	3.5%
NaB	Namur loam, 0 to 6 percent slopes	40.1	13.0%
QUA	Quarry	59.1	19.1%
Ra	Rock outcrop	3.4	1.1%
SvB	Summerville loam, 2 to 6 percent slopes	60.0	19.4%
SvC	Summerville loam, 6 to 12 percent slopes	5.4	1.8%
Totals for Area of Interest		**308.8**	**100.0%**

Door County, Wisconsin

ApC—Alpena gravelly sandy loam, 0 to 12 percent slopes

Map Unit Setting

National map unit symbol: g5br
Elevation: 600 to 860 feet
Mean annual precipitation: 27 to 33 inches
Mean annual air temperature: 41 to 45 degrees F
Frost-free period: 130 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Alpena and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Alpena

Setting

Landform: Eskers, beach ridges on lake plains
Landform position (two-dimensional): Summit, shoulder, backslope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy glaciofluvial deposits over stratified sandy and gravelly glaciofluvial deposits

Typical profile

A,C - 0 to 12 inches: gravelly sandy loam
2C - 12 to 60 inches: stratified gravelly sand to sand

Properties and qualities

Slope: 0 to 12 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (1.98 to 19.98 in/hr)
Depth to water table: About 60 to 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 25 percent
Available water storage in profile: Very low (about 2.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Forage suitability group: Low AWC, adequately drained (G095AY002WI)
Hydric soil rating: No

Minor Components

Kiva sandy loam
Percent of map unit: 4 percent
Hydric soil rating: No

Slope is greater than 12%
Percent of map unit: 4 percent
Hydric soil rating: No

Dolomite bedrock is at 40
Percent of map unit: 2 percent
Hydric soil rating: No

Data Source Information

Soil Survey Area: Door County, Wisconsin
Survey Area Data: Version 14, Sep 12, 2018

Door County, Wisconsin

NaB—Namur loam, 0 to 6 percent slopes

Map Unit Setting

National map unit symbol: g5d3
Elevation: 600 to 860 feet
Mean annual precipitation: 27 to 33 inches
Mean annual air temperature: 41 to 45 degrees F
Frost-free period: 130 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Namur and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Namur

Setting

Landform: Ground moraines
Landform position (two-dimensional): Summit, shoulder, backslope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy till

Typical profile

A,Bw - 0 to 8 inches: loam
2R - 8 to 79 inches: bedrock

Properties and qualities

Slope: 0 to 6 percent
Depth to restrictive feature: 5 to 12 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 20 percent
Available water storage in profile: Very low (about 1.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Forage suitability group: Low AWC, adequately drained (G095AY002WI)
Hydric soil rating: No

Minor Components

Namur variant loam
Percent of map unit:
Hydric soil rating: No

Slope is greater than 6%
Percent of map unit:
Hydric soil rating: No

Summerville loam
Percent of map unit:
Hydric soil rating: No

Bedrock outcrops
Percent of map unit:
Hydric soil rating: No

Bonduel shallow variant
Percent of map unit:
Hydric soil rating: No

Data Source Information

Soil Survey Area: Door County, Wisconsin
Survey Area Data: Version 14, Sep 12, 2018

Door County, Wisconsin

LoC—Longrie Loam, 6 to 12 percent slopes

Map Unit Setting

National map unit symbol: 2szgg
Elevation: 690 to 830 feet
Mean annual precipitation: 29 to 31 inches
Mean annual air temperature: 43 to 46 degrees F
Frost-free period: 130 to 160 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Longrie and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Longrie

Setting

Landform: Ground moraines
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy till over residuum weathered from limestone

Typical profile

Ap - 0 to 2 inches: loam
E - 2 to 4 inches: sandy loam
Bs - 4 to 14 inches: sandy loam
C - 14 to 28 inches: fine sandy loam
2R - 28 to 79 inches: bedrock

Properties and qualities

Slope: 6 to 12 percent
Depth to restrictive feature: 25 to 35 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to strongly saline (0.0 to 20.0 mmhos/cm)
Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Summerville

Percent of map unit: 7 percent
Landform: Ground moraines
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Emmet

Percent of map unit: 3 percent
Landform: Ground moraines
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Data Source Information

Soil Survey Area: Door County, Wisconsin
Survey Area Data: Version 14, Sep 12, 2018

Map

Printed 07/31/2019 courtesy of Door County Land Information Office

... from the Web Map of ...
(//www.co.door.wi.gov)

Door County, Wisconsin
... for all seasons!

GROUNDWATER @ POND C IS ELEV. 583.9± BY INTERPOLATION.

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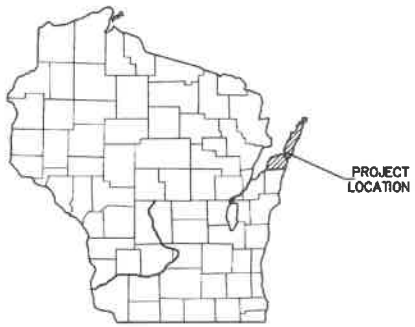
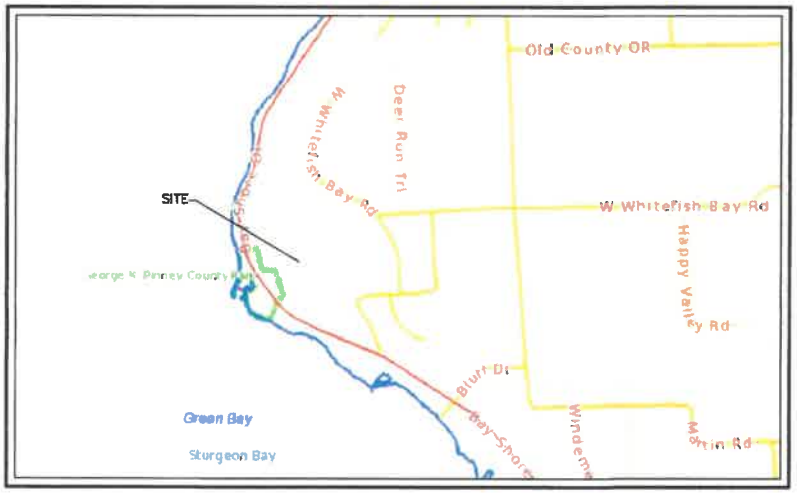
Quarry Bluff

GRADING, DRAINAGE, & EROSION CONTROL PLANS

JOB NUMBER
22061



DOOR COUNTY, WISCONSIN



INDEX OF SHEETS

SHEET NO.	DESCRIPTION
C100	COVER & INDEX SHEET
C101	EXISTING SITE PLAN
C102	SITE PLAN
C103	GRADING PLAN
C104	EROSION CONTROL PLAN
C200	CONSTRUCTION DETAILS
C201	CONSTRUCTION DETAILS
C202	CONSTRUCTION DETAILS
C203	CONSTRUCTION DETAILS
C204	POND A DETAILS
C205	POND B DETAILS
C206	POND C DETAILS

PREPARED FOR:
QUARRY BLUFF, LLC
c/o MIKE PARENT
P.O. BOX 889
SISTER BAY, WI 54234

BAUDHUIN SURVEYING & ENGINEERING
312 N. 5TH AVE.
P.O. BOX 105
STURGEON BAY, WI.
54235
PHONE: 920-743-6211

Quarry Bluff

COVER & INDEX SHEET

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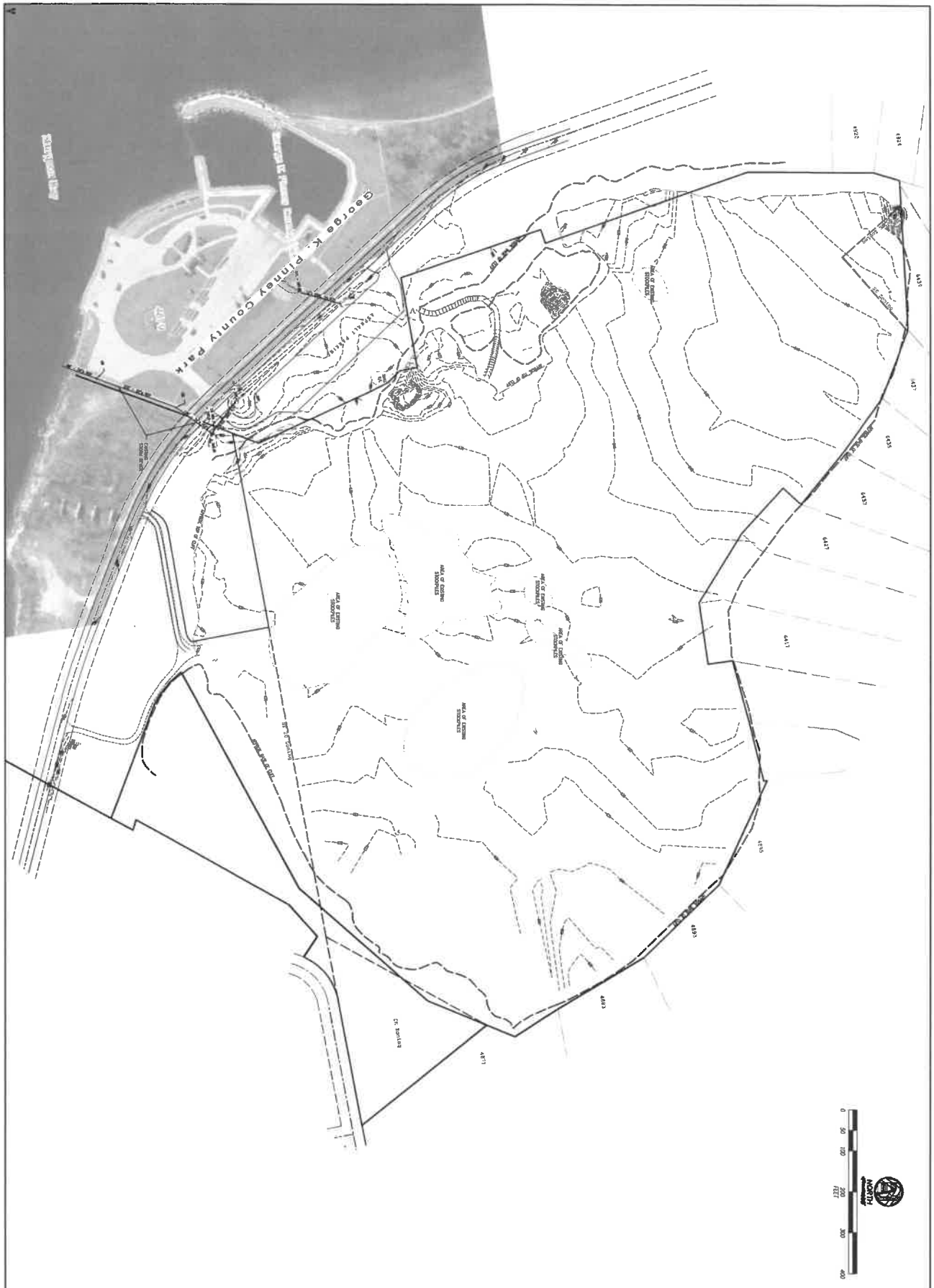
C100



C101

REUSE OF DOCUMENTS
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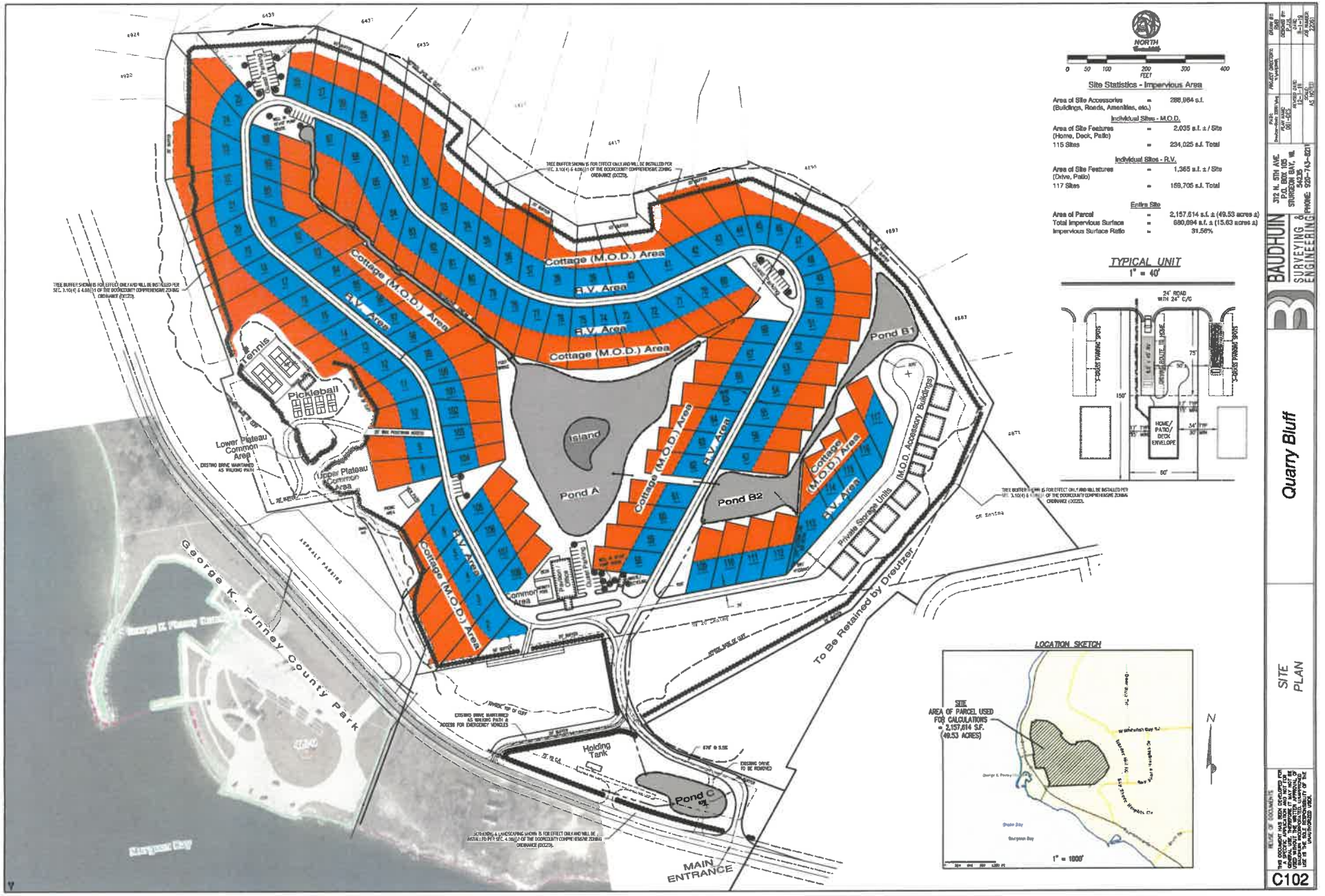
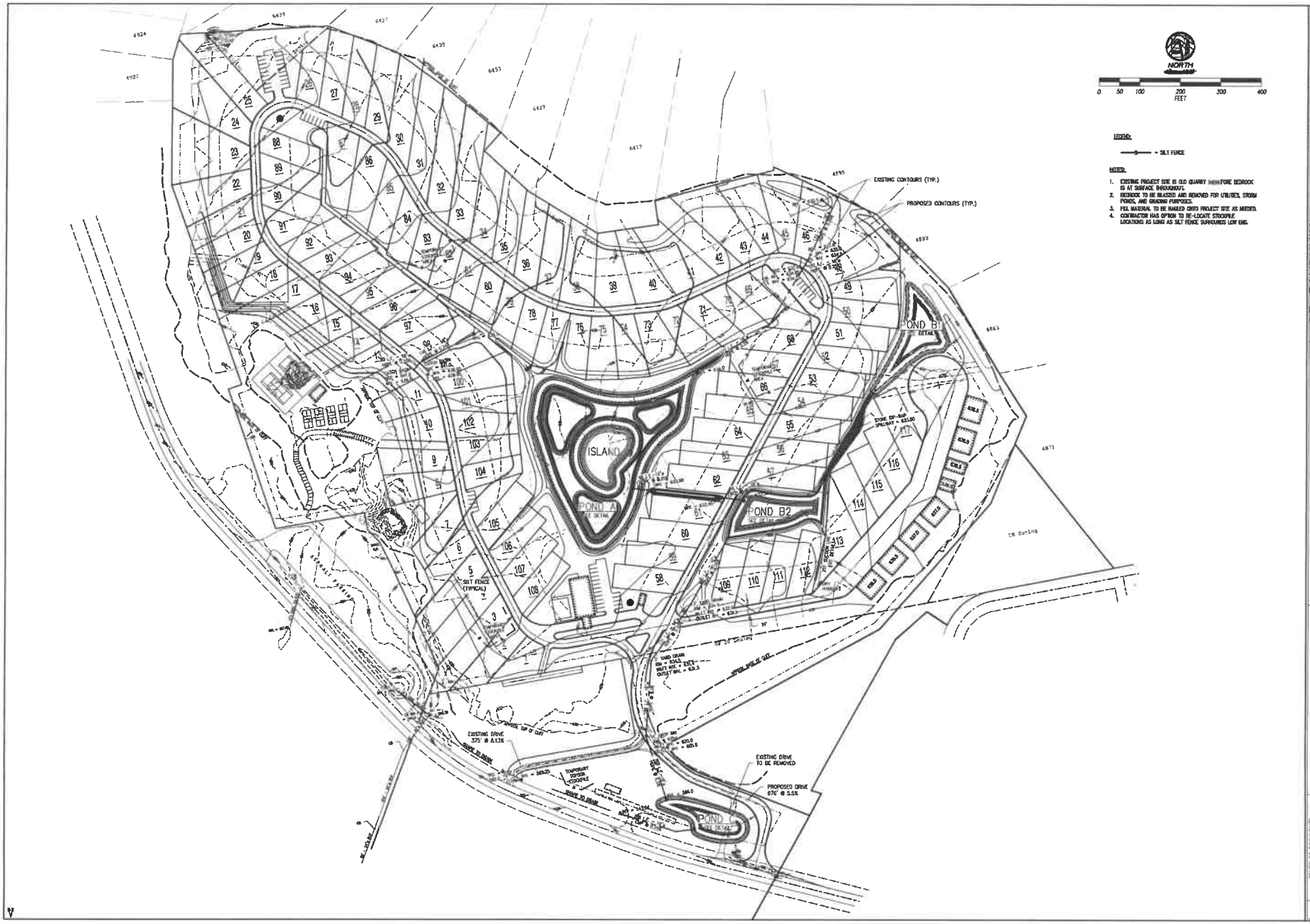
EXISTING
SITE PLAN

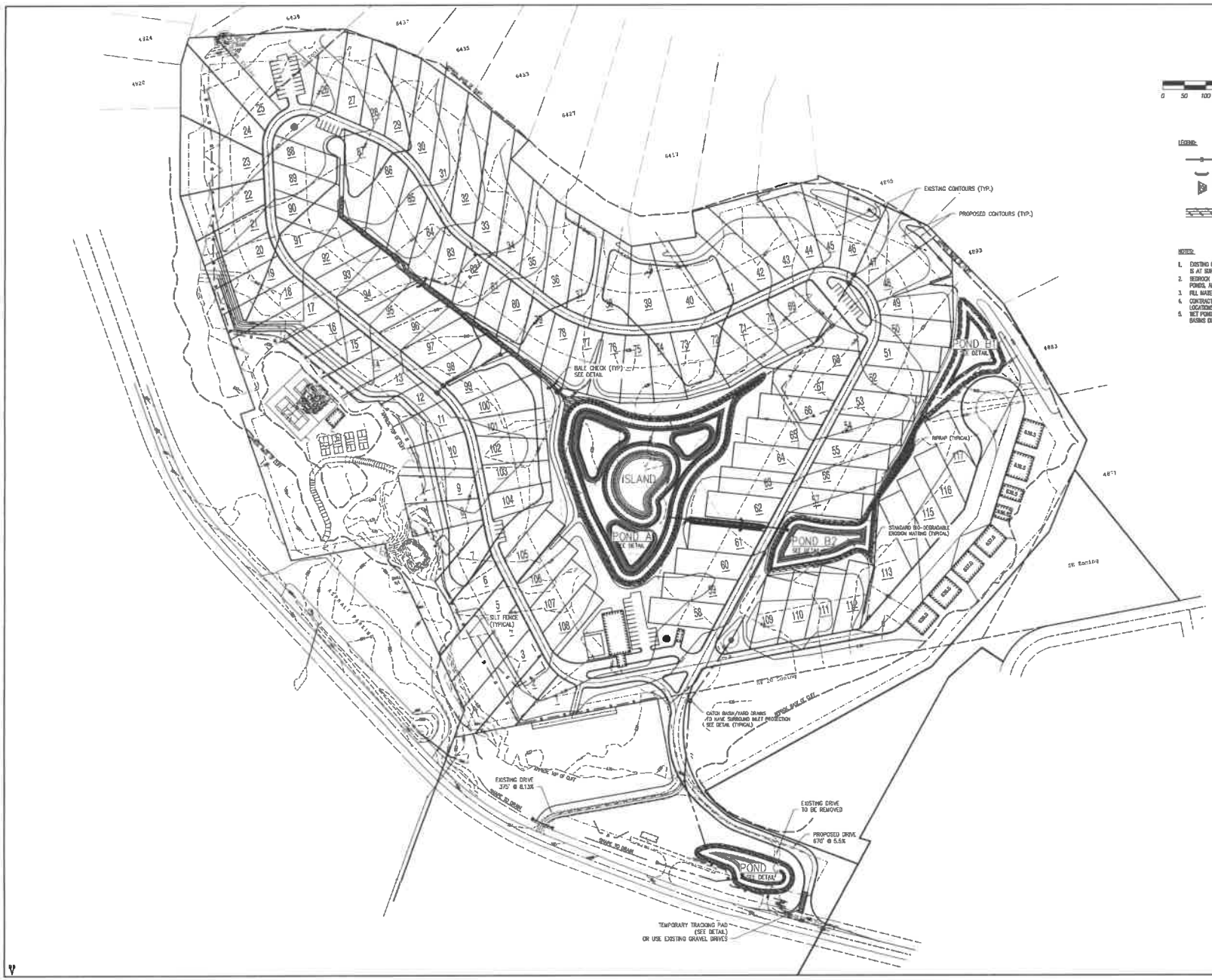
Quarry Bluff

BAUDHUIN
SURVEYING & ENGINEERING
312 N. 5TH AVE.
P.O. BOX 105
STURGEON BAY, WI.
54235
PHONE: 920-743-8211

PAPER	PROJECT DIRECTORY:	DRAWN BY:
		RMB
PLAN NAME:		DESIGNED BY:
Q61-DES		PJH
REVISED DATE:		DATE:
12-3-19		8-1-19
SCALE:		JOB NUMBER:
AS NOTED		20261


NORTH
0 50 100 200 300 400
FEET
Site Statistics - Impervious Area
Area of Site Accessories = 288,964 s.f.
(Buildings, Roads, Amenities, etc.)
Individual Sites - M.O.D.
Area of Site Features = 2,035 s.f. ± / Site
(Home, Deck, Patio)
115 Sites = 234,025 s.f. Total
Individual Sites - R.V.
Area of Site Features = 1,365 s.f. ± / Site
(Drive, Patio)
117 Sites = 159,705 s.f. Total
Entire Site
Area of Parcel = 2,157,614 s.f. ± (49.53 acres ±)
Total Impervious Surface = 680,694 s.f. ± (15.63 acres ±)
Impervious Surface Ratio = 31.56%
TYPICAL UNIT
1" = 40'
24' ROAD WITH 24" C/C
HOME/ PATIO/ DECK ENVELOPE
Cottage (M.O.D.) Area
R.V. Area
Island
Pond A
Pond B1
Pond B2
Pond C
Tennis
Pickleball
Lower Plateau Common Area
Upper Plateau Common Area
Common Area
Private Storage Units (M.O.D. Accessory Buildings)
George K. Pinney County Park
To Be Retained by Dreutzer
Holding Tank
MAIN ENTRANCE
LOCATION SKETCH
SITE
AREA OF PARCEL USED FOR CALCULATIONS = 2,157,614 S.F. (49.53 ACRES)
1" = 1000'
BAUDHUIN SURVEYING & ENGINEERING
312 N. 5TH AVE.
P.O. BOX 105
STURGEON BAY, WI.
54235
PHONE: 920-743-8211
Quarry Bluff
SITE PLAN
C102


NORTH
0 50 100 200 300 400
FEET
LEGEND:
SILT FENCE
NOTES:
1. EXISTING PROJECT SITE IS OLD QUARRY WHEREFORE BEDROCK IS AT SURFACE THROUGHOUT.
2. BEDROCK TO BE BLASTED AND REMOVED FOR UTILITIES, STORM PONDS, AND GRADING PURPOSES.
3. FILL MATERIAL TO BE HAULED ONTO PROJECT SITE AS NEEDED.
4. CONTRACTOR HAS OPTION TO RE-LOCATE STOCKPILE LOCATIONS AS LONG AS SILT FENCE SURROUNDS LOW END.
EXISTING CONTOURS (TYP.)
PROPOSED CONTOURS (TYP.)
ISLAND
POND A
POND B2
POND B
POND C
SILT FENCE (TYPICAL)
EXISTING DRIVE 375' @ 8.13%
EXISTING DRIVE TO BE REMOVED
PROPOSED DRIVE 670' @ 5.5%
TEMPORARY TOPSOIL STOCKPILE
SHAPE TO DRAIN
APPROX. TOP OF CUT
APPROX. BASE OF CUT
IR Zoning
BAUDHUIN SURVEYING & ENGINEERING
312 N. 5TH AVE.
P.O. BOX 105
STURGEON BAY, WI.
54235
PHONE: 920-743-8211
Quarry Bluff
GRADING PLAN
C103



BAUDHUIN SURVEYING & ENGINEERING
312 N. 5TH AVE.
P.O. BOX 105
STURGEON BAY, WI. 54235
PHONE: 920-743-8211

Quarry Bluff

EROSION CONTROL PLAN

C104

Erosion Control Notes

1. IN ACCORDANCE WITH NR 216.46(9) AND NR 216.48(4), THE LANDOWNER, OR THE LANDOWNER'S REPRESENTATIVE, SHALL INSPECT EROSION AND SEDIMENT CONTROL PRACTICES WEEKLY, AND WITHIN 24 HOURS FOLLOWING A RAINFALL OF 0.5 INCHES OR GREATER. WRITTEN DOCUMENTATION OF EACH INSPECTION SHALL BE MAINTAINED AT THE CONSTRUCTION SITE AND SHALL INCLUDE THE DATE, TIME AND LOCATION OF INSPECTION, THE PHASE OF LAND DISTURBANCE AT THE CONSTRUCTION SITE, PERSON CONDUCTING THE INSPECTION, ASSESSMENT OF CONTROL PRACTICES, AND A DESCRIPTION OF ANY EROSION OR SEDIMENT CONTROL MEASURE INSTALLATION OR MAINTENANCE PERFORMED IN RESPONSE TO THE INSPECTION.
2. ANY SOIL STOCKPILE THAT REMAINS FOR MORE THAN 7 DAYS SHALL BE COVERED OR TREATED WITH STABILIZATION PRACTICES SUCH AS TEMPORARY OR PERMANENT SEEDING AND MULCHING. SEEDING SHALL FOLLOW THE REQUIREMENTS OF WDNR TECHNICAL STANDARDS 1058 AND 1059 AND WIS. DOT STANDARD SPECIFICATIONS, SECTION 630.
3. A MINIMUM OF 4 TO 6 INCHES OF TOPSOIL MUST BE APPLIED TO ALL AREAS TO BE SEEDED OR SODDED ACCORDING TO WDNR TECHNICAL STANDARD 1058.
4. ALL OFF-SITE SEDIMENT DEPOSITS OCCURRING AS A RESULT OF CONSTRUCTION WORK OR STORM EVENT SHALL BE CLEANED UP BY THE END OF EACH DAY. FLUSHING SHALL NOT BE ALLOWED. IMPLEMENT TEMPORARY GRADING PRACTICES AS DESCRIBED IN WDNR TECHNICAL STANDARDS 1086 AND 1067 TO PREVENT SEDIMENT FROM LEAVING THE SITE.
5. ALL DISTURBED AREAS SHALL BE TREATED WITH STABILIZATION MEASURES, AS SPECIFIED, WITHIN 3 WORKING DAYS OF FINAL GRADING.
6. ANY SOIL EROSION THAT OCCURS AFTER FINAL GRADING AND/OR THE APPLICATION OF STABILIZATION MEASURES MUST BE REPAIRED AND STABILIZATION WORK REDONE.
7. TREAT ANY DISTURBED AREA THAT REMAINS INACTIVE FOR GREATER THAN 30 WORKING DAYS OR WHERE GRADING WORK EXTENDS BEYOND THE PERMANENT SEEDING DEADLINES WITH TEMPORARY BEST MANAGEMENT PRACTICES SUCH AS LAND APPLICATION OF ANIONIC POLYACRYLAMIDE, STRAW BALES, SILT FENCE, MULCHING, TEMPORARY SEEDING, AND SEDIMENT TRAPS AS RESPECTIVELY REQUIRED BY WDNR TECHNICAL STANDARDS 1050, 1055, 1056, 1058, 1059, AND 1063.
8. ALL TEMPORARY BEST MANAGEMENT PRACTICES SHALL BE MAINTAINED UNTIL THE SITE IS STABILIZED.
9. WIND EROSION SHALL BE KEPT TO A MINIMUM DURING CONSTRUCTION. WATERING, MULCHING, OR A TACKING AGENT MAY NEED TO BE UTILIZED TO PROTECT NEARBY RESIDENTS AND WATER RESOURCES. DUST CONTROL MEASURES SHALL BE IMPLEMENTED ACCORDING TO WDNR TECHNICAL STANDARD 1068.
10. WHEN THE DISTURBED AREA HAS BEEN STABILIZED BY PERMANENT VEGETATION OR OTHER MEANS, TEMPORARY BEST MANAGEMENT PRACTICES SUCH AS SILT FENCE, STRAW BALES, AND SEDIMENT TRAPS SHALL BE REMOVED.
11. ALL REMAINING TOPSOIL STOCKPILES SHALL BE SEEDED OR HAULED OFF-SITE WITHIN 60 DAYS OF CONSTRUCTION COMPLETION.
12. WINTER STABILIZATION : ALL AREAS REQUIRING SEED AFTER OCTOBER 15TH SHALL BE STABILIZED BY AN APPROVED WINTER STABILIZATION METHOD. THE RECOMMENDED METHOD IS UTILIZING A HYDROSEEDER CONTAINING ADEQUATE TACKIFIER POLYMER MIXED WITH WINTER WHEAT OR RYE SEED. ANOTHER ACCEPTABLE EROSION CONTROL METHOD IS THE LAND APPLICATION OF ANIONIC POLYACRYLAMIDE IN CONFORMANCE WITH WDNR TECHNICAL STANDARD 1050.
13. ADDITIONAL EROSION CONTROL METHODS SUCH AS SILT FENCE, BALE CHECKS, EROSION MAT, (ABOVE AND BEYOND THE QUANTITIES LISTED IN THE BID PROPOSAL) AS NEEDED TO PREVENT WASHOUT OR SILT TRANSFER PROBLEMS WITHIN THE CONSTRUCTION AREA OR DOWNSTREAM SHALL BE CONSIDERED INCIDENTAL TO THIS PROPOSAL.

Stabilization Specifications

(REFER TO EROSION CONTROL PLAN FOR APPLICABLE AREAS)

MULCH: MATERIAL SHALL CONSIST OF ANY STRAW, HAY, WOOD EXCELSIOR FIBER OR OTHER SUITABLE MATERIAL OF A SIMILAR NATURE WHICH IS SUBSTANTIALLY FREE OF NOXIOUS WEED SEEDS AND OBJECTIONABLE FOREIGN MATTER. MULCH SHALL CONFORM TO WDNR TECHNICAL STANDARD 1058.

STANDARD BIODEGRADABLE MAT: CLASS 1, TYPE A, AS LISTED IN THE LATEST EDITION OF THE WIS. DOT EROSION CONTROL P.A.L. PRODUCTS WITH UV DEGRADABLE NETTING SHALL NOT BE INSTALLED AFTER SEPTEMBER 1ST. TYPE B MAT MAY BE USED IN REPLACEMENT FOR TYPE A MAT AT THE OPTION OF THE CONTRACTOR WITH NO ADDITIONAL COST TO THE OWNER. EROSION MAT SHALL ALSO MEET THE REQUIREMENTS OF WDNR TECHNICAL STANDARD 1053.

HIGH VELOCITY EROSION MAT: CLASS 1, TYPE B, AS LISTED IN THE LATEST EDITION OF THE WIS. DOT EROSION CONTROL P.A.L. PRODUCTS WITH UV DEGRADABLE NETTING SHALL NOT BE INSTALLED AFTER SEPTEMBER 1ST. EROSION MAT SHALL ALSO MEET THE REQUIREMENTS OF WDNR TECHNICAL STANDARD 1053.

STAPLES: USE U-SHAPED STAPLES NO. 11 GAUGE OR HEAVIER STEEL WIRE OR OTHER APPROVED MATERIALS, WITH A WIDTH OF ONE TO TWO INCHES, AND A LENGTH NOT LESS THAN 6 INCHES FOR FIRM SOILS AND NOT LESS THAN 12 INCHES FOR LOOSE SOILS.

INSTALLATION: ALL EROSION MATTING SHALL BE INSTALLED WITH DOWNSLOPE EDGE BURIED OR OVERLAPPED A MINIMUM OF 3 INCHES BY UPSLOPE MATTING TO PREVENT UNDERFLOWS.

RIP-RAP : 4-12" ROCK, 50% > 6", 10-20% < 2" (OVER 8 OZ. GEOTEXTILE) DECORATIVE STONE MAY BE USED AS LONG AS IT MEETS SPECIFICATIONS.

WIS DOT Standard Specifications
Section 630
Permanent Seed Mixtures

SPECIES	% MINIMUM PURITY	% MINIMUM GERMINATION	MIXTURE PROPORTIONS In percent NO. 10	NO. 20	NO. 30	NO. 40
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
[illegible]	97	[illegible]		[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]		[illegible]		
[illegible]	[illegible]	[illegible]			[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]			
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
IMPROVED FINE PERENNIAL [illegible]	96	85			15	25
[illegible]	[illegible]	[illegible]	10			
[illegible]	[illegible]	[illegible]			[illegible]	

1. USE SEED MIXTURE NO. 10 WHERE AVERAGE LOAM, HEAVY CLAY, OR MOIST SOILS PREDOMINATE.
2. USE SEED MIXTURE NO. 30 WHERE LIGHT, DRY, WELL-DRAINED, SANDY, OR GRAVELLY SOILS PREDOMINATE AND FOR ALL HIGH CUT AND FILL SLOPES GENERALLY EXCEEDING 6 TO 8 FEET (1.8 TO 2.4 m).
3. USE SEED MIXTURE NO. 10 OR NO. 20 ON ALL DITCHES, INSLOPES, MEDIAN AREAS, AND LOW FILLS, EXCEPT WHERE USING NO. 30.
4. USE SEED MIXTURE NO. 30 FOR MEDIANS AND ON SLOPES OR DITCHES GENERALLY WITHIN 15 FEET (4.5 m) OF THE SHOULDER WHERE A SALT-TOLERANT TURF IS PREFERRED.
5. USE SEED MIXTURE NO. 40 IN URBAN OR OTHER AREAS WHERE A LAWN TYPE TURF IS PREFERRED.

USE THE FOLLOWING SOWING RATE FOR SEEDS IN POUNDS (kg) PER 1000 SQUARE FEET (100 SQUARE METERS) OF AREA:

- SEED MIXTURE NO. 10 AT 1.5 POUNDS (0.7 kg)
- SEED MIXTURE NO. 20 AT 3.0 POUNDS (1.3 kg)
- SEED MIXTURE NO. 30 AT 2.0 POUNDS (1.0 kg)
- SEED MIXTURE NO. 40 AT 2.0 POUNDS (1.0 kg)

Procedures of Construction

BASED ON A 90 DAY SCHEDULE
ANTICIPATED START : APRIL 1, 2020

1. INSTALL EROSION CONTROL MEASURES PER PLAN. (COMPLETED DAY 1)
2. BLAST AND REMOVE BEDROCK FOR UTILITES, STORM PONDS AND FINAL GRADING. (COMPLETED DAY 10)
3. WET PONDS A, B1, B2, AND C: EXCAVATE AND GRADE STORM PONDS. INSTALL LINERS AND OUTLET STRUCTURES. (COMPLETED DAY 20)
4. UTILIZE WET PONDS A, B1, B2, AND C AS SEDIMENT BASINS DURING CONSTRUCTION.
5. INSTALL SEWER, WATER, CULVERTS & UTILITIES. (COMPLETED DAY 30)
6. GRADE SITE TO SUB GRADE. (COMPLETED DAY 40)
7. PLACE GRAVEL IN ROADS AND PARKING LOTS. (COMPLETED DAY 55)
8. TOPSOIL, SEED, FERTILIZE AND MULCH ALL DISTURBED AREAS. (COMPLETED DAY 70)
9. INSTALL STABILIZATION MEASURES (EROSION NETTING/MATTING PER PLAN). (COMPLETED DAY 70)
10. INSTALL BINDER COURSE ON ROAD AND PARKING LOTS AND CURB AND GUTTER. (COMPLETED DAY 90)
11. EXCAVATE SEDIMENT FROM CONSTRUCTION SITE RUNOFF OUT OF STORM PONDS TO MATCH PLAN GRADE AFTER AT LEAST 75% OF THE PERMANENT VEGETATION HAS BEEN ESTABLISHED. (AS NEEDED)
12. VERIFY ENGINEERED MEDIA IN BASE OF BIO-DETENTION POND B2 INFILTRATES PER DESIGN. REMOVE ANY SEDIMENT AND REMEDIATE MEDIA AS NEEDED. MINIMAL COMPACTION REQUIRED. PLANT PER PLAN AFTER SITE HAS STABILIZED. (AS NEEDED)
13. TOPSOIL, SEED, FERTILIZE AND MULCH ALL REDISTURBED AREAS.
14. REMOVE EROSION CONTROL MEASURES AFTER VEGETATION HAS BEEN WELL ESTABLISHED.

Site Dewatering

(IF NEEDED - NOT ANTICIPATED)

1. DEWATERING FOR POND & UTILITY CONSTRUCTION SHALL CONFORM TO REQUIREMENTS SET FORTH IN WDNR TECHNICAL STANDARD 1061.
2. THE CONTRACTOR HAS THE OPTION TO UTILIZE WDNR APPROVED METHODS INCLUDING:
   - GEOTEXTILE BAGS (SEE TECHNICAL STANDARD 1061)
   - SEDIMENT TRAPS (SEE TECHNICAL STANDARD 1063)
   - SEDIMENT BASINS (SEE TECHNICAL STANDARD 1064)
3. CONTRACTOR HAS OPTION TO UTILIZE STORM PONDS CONSTRUCTED ON THIS SITE AS SEDIMENT BASINS FOR DEWATERING.
4. CONTRACTOR SHALL LIMIT PUMP RATE TO BE LESS THAN 70 G.P.M. TO PREVENT NEED FOR WDNR WELL PERMIT.
5. IN NO EVENT SHALL UNTREATED DISCHARGE BE ALLOWED TO FLOW DIRECTLY INTO WETLANDS OR WATERWAYS.

Temporary Seeding

SPECIES	% MINIMUM PURITY	% MINIMUM GERMINATION
ANNUAL OATS	98	90
AGRICULTURAL RYE	97	85
WINTER WHEAT	95	90
ANNUAL RYEGRASS	97	90

1. USE OATS IN SPRING AND SUMMER PLANTINGS.
2. USE WINTER WHEAT OR RYE FOR FALL PLANTINGS STARTED AFTER SEPTEMBER 1.
3. APPLY TEMPORARY SEEDING AT 3 POUNDS PER 1000 SQUARE FEET OF AREA, EXCEPT ANNUAL RYEGRASS WHICH MAY BE APPLIED AT 2 POUNDS PER 1000 SQUARE FEET OF AREA.

Wet Seed Mix

(IN BASE OF BIO-DETENTION PONDS)

Prairie Seed Mixture
CREP Wet Site Mix
(To be used in flood prone areas)

Species	Plant Type	PLS oz/acre
Prairie Cordgrass	Grass	4.0
Rice Cutgrass	Grass	2.0
Switchgrass	Grass	8.0
Virginia Wild Rye	Grass	16.0
Woolgrass	Sedge	1.0
Fox Sedge	Sedge	2.0
Great St. Johns Wort	Forb	1.0
Marsh Milkweed	Forb	2.0
Sneezeweed	Forb	1.0
Joe-Pye Weed	Forb	2.0
Blue Vervain	Forb	2.0

(OR EQUIVALENT)

NOTE:
OWNER HAS OPTION TO PLANT STANDARD GRASS IN BASE OF BIO-DENTENTION PONDS IF PRAIRIE LOOK IS NOT DESIRED. RE-PLANTING OF THESE AREAS USING WET MIX MAY BE NECESSARY IF GRASS CANNOT BE MAINTAINED.

Storm Drain Inlet Protection Detail

NO SCALE

GENERAL NOTES

MANUFACTURED ALTERNATIVES APPROVED AND LISTED ON THE WISCONSIN DOT EROSION CONTROL PRODUCT ACCEPTABILITY LIST MAY BE SUBSTITUTED.

WHEN REMOVING OR MAINTAINING INLET PROTECTION, CARE SHALL BE TAKEN SO THAT THE SEDIMENT TRAPPED ON THE GEOTEXTILE FABRIC DOES NOT FALL INTO THE INLET. ANY MATERIAL FALLING INTO THE INLET SHALL BE REMOVED IMMEDIATELY.

1 ① FINISHED SIZE, INCLUDING FLAP POCKETS WHERE REQUIRED, SHALL EXTEND A MINIMUM OF 10" AROUND THE PERIMETER TO FACILITATE MAINTENANCE OR REMOVAL.

② FOR INLET PROTECTION, TYPE C (WITH CURB BOX), AN ADDITIONAL 18" OF FABRIC IS WRAPPED AROUND THE WOOD AND SECURED WITH STAPLES. THE WOOD SHALL NOT BLOCK THE ENTIRE HEIGHT OF THE CURB BOX OPENING.

③ FLAP POCKETS SHALL BE LARGE ENOUGH TO ACCEPT WOOD 2X4.

INSTALLATION NOTES

TYPE B & C

TRIM EXCESS FABRIC IN THE FLOW LINE TO WITHIN 3" OF THE GRATE.

THE CONTRACTOR SHALL DEMONSTRATE A METHOD OF MAINTENANCE, USING A SEWN FLAP, HAND HOLDS OR OTHER METHOD TO PREVENT ACCUMULATED SEDIMENT FROM ENTERING THE INLET.

TYPE D

DO NOT INSTALL INLET PROTECTION TYPE D IN INLETS SHALLOWER THAN 30", MEASURED FROM THE BOTTOM OF THE INLET TO THE TOP OF THE GRATE.

TRIM EXCESS FABRIC IN THE FLOW LINE TO WITHIN 3" OF THE GRATE.

THE INSTALLED BAG SHALL HAVE A MINIMUM SIDE CLEARANCE, BETWEEN THE INLET WALLS AND THE BAG, MEASURED AT THE BOTTOM OF THE OVERFLOW HOLES, OF 3". WHERE NECESSARY THE CONTRACTOR SHALL CINCH THE BAG, USING PLASTIC ZIP TIES, TO ACHIEVE THE 3" CLEARANCE. THE TIES SHALL BE PLACED AT A MAXIMUM OF 4" FROM THE BOTTOM OF THE BAG.

This drawing based on Wisconsin Department of Transportation Standard Detail Drawing 8 E 10-2.

NOTE:
INLET PROTECTION SHALL CONFORM TO WDNR TECHNICAL STANDARD 1060.

CONTRACTOR IS RESPONSIBLE FOR MAINTENANCE AND DOCUMENTATION OF EROSION CONTROL MEASURES THROUGHOUT CONSTRUCTION PHASE. OWNER IS RESPONSIBLE FOR MAINTENANCE AFTER CONTRACTOR LEAVES THE SITE.

DRAWN BY: RMB
DESIGNED BY: P.J.H.
DATE: 8-1-19
JOB NUMBER: 22061
PROJECT DIRECTORY:
PATH:
PLAN NAME: D61-DES
REVISED DATE: 12-3-19
SCALE: AS NOTED

BAUDHUIN SURVEYING & ENGINEERING
312 N. 5TH AVE.
P.O. BOX 105
STURGEON BAY, WI 54235
PHONE: 920-743-8211

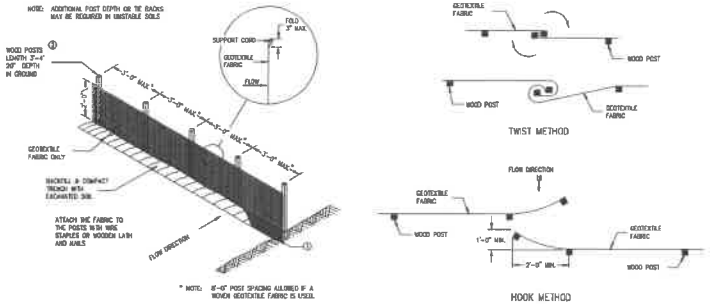
Quarry Bluff

CONSTRUCTION DETAILS

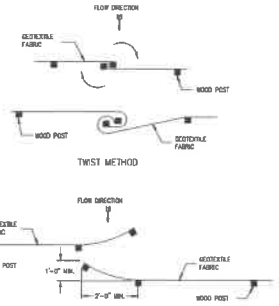
REUSE OF DOCUMENTS
THIS DOCUMENT HAS BEEN DEVELOPED FOR A SPECIFIC APPLICATION AND NOT FOR GENERAL USE. THEREFORE IT MAY NOT BE USED WITHOUT THE WRITTEN APPROVAL OF BAUDHUIN INCORPORATED. UNAPPROVED USE IS THE SOLE RESPONSIBILITY OF THE UNAUTHORIZED USER.

C200

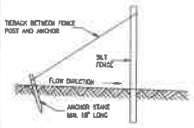
Silt Fence Detail
NO SCALE



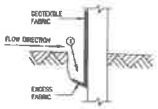
SILT FENCE



JOINING TWO LENGTHS OF SILT FENCE ⑤



SILT FENCE TIE BACK
(WHEN ADDITIONAL SUPPORT REQUIRED)

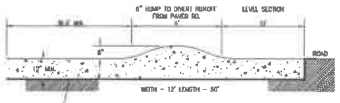


TRENCH DETAIL

GENERAL NOTES

1. TRENCH SHALL BE A MINIMUM OF 4" WIDE & 8" DEEP TO BURY AND ANCHOR THE GEOTEXTILE FABRIC. FOLD MATERIAL TO FIT TRENCH AND BACKFILL & COMPACT TRENCH WITH EXCAVATED SOIL.
2. WOOD POSTS SHALL BE A MINIMUM SIZE OF 1-1/8" x 1-1/8" OF OAK OR HICKORY.
3. CONSTRUCT SILT FENCE FROM A CONTINUOUS ROLL IF POSSIBLE BY CUTTING LENGTHS TO AVOID JOINTS. IF A JOINT IS NECESSARY USE ONE OF THE FOLLOWING TWO METHODS: A) OVERLAP THE TWO POSTS AND TWIST, OR ROTATE, AT LEAST 180 DEGREES, B) HOOK THE END OF EACH SILT FENCE LENGTH.
4. SILT FENCE SHALL CONFORM TO WDNR TECHNICAL STANDARD 1056.

Temporary Stone Tracking Pad Detail
NO SCALE



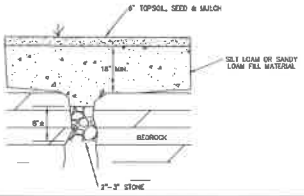
SPECIFICATIONS:
1. CLEAR THE ENTRANCE / EXIT AREA OF ALL VEGETATION, ROOTS, AND OTHER OBJECTIONABLE MATERIAL.
2. GRADE THE ROAD FOUNDATION SO THAT THE ENTRANCE / EXIT WILL HAVE A CROSS SLOPE.
3. PLACE STONE TO THE DIMENSIONS, GRADE AND ELEVATION SHOWN.
4. USE WASHED STONE 3" TO 6" IN SIZE.
5. DO NOT COMPACT AGGREGATE.

NOTE:
- MAINTAIN THE STONE PAD IN A CONDITION TO PREVENT MUD OR SEDIMENT FROM LEAVING THE SITE.
- MUD OR SEDIMENT THAT IS TRACKED OR WASHED ONTO ROAD MUST BE REMOVED IMMEDIATELY.
- TRACKOUT PAD SHALL CONFORM TO WDNR TECHNICAL STANDARD 1057.

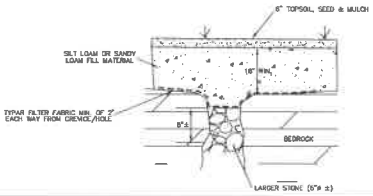
Rock Hole / Crevice Patch Details
NO SCALE

REQUIRED ONLY IF ROCK HOLE ENCOUNTERED WITHIN BASE OF STORM POND AND UNTILITY TRENCHES WHERE BLASTING AND REMOVAL OF BEDROCK IS REQUIRED.

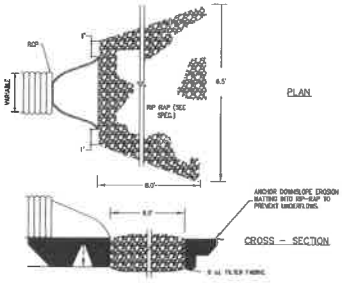
OPTION #1
(IF HOLE/CREVICE IS LESS THAN 4" WIDE)



OPTION #2
(IF HOLE/CREVICE IS GREATER THAN 4" WIDE)

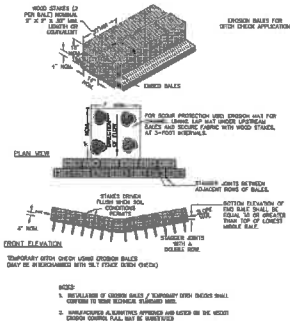


Culvert Rip-rap Detail
NO SCALE



(ALL DOWNSLOPE ENDS OF CULVERTS)

Channel Bale Check Detail
NO SCALE



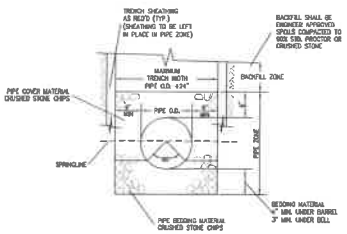
NOTES:
1. INSTALLATION OF EROSION BALES / TEMPORARY DITCH CHECKS SHALL CONFORM TO WDNR TECHNICAL STANDARD 1060.
2. MAINTENANCE & SURETIES APPROVED AND LISTED ON THE WISCONSIN EROSION CONTROL PLAN, MAY BE MODIFIED

Wet Pond Liner
PER WET DETENTION POND DNR TECHNICAL STANDARD 1001
FOR WET PONDS ONLY (POND A AND B1)

TYPE B LINERS – FOR SITES WITH MEDIUM POTENTIAL FOR GROUNDWATER POLLUTION OR WHERE NEED FOR A FULL POOL LEVEL IS HIGH. THEY INCLUDE:
- ALL LINERS MEETING TYPE A CRITERIA
- CLAY
- HDPE
- POLY ETHYLENE POND LINER (PPL)

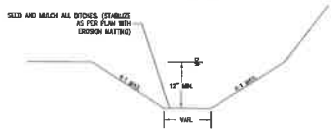
1. CLAY LINER CRITERIA:
   A. SOIL FINES (200 SIEVE) OR MORE.
   B. AN IN-PLACE HYDRAULIC CONDUCTIVITY OF 1×10^{-6} CM./SEC. OR LESS.
   C. AVERAGE LIQUID LIMIT VALUE OF 15 OR GREATER, WITH NO VALUE LESS THAN 14.
   D. AVERAGE PI OF 7 OR MORE WITH NO VALUES LESS THAN 14.
   E. CLAY COMPACTION AND DOCUMENTATION AS SPECIFIED IN NRCS WISCONSIN CONSTRUCTION SPECIFICATION 204, EARTHFULL FOR WASTE STORAGE FACILITIES.
   F. MINIMUM THICKNESS OF TWO FEET.
   G. SPECIFY METHOD FOR KEEPING THE POOL FULL OR USE OF COMPOSITE SOILS BELOW LINER.
2. HDPE LINER CRITERIA:
   A. MINIMUM THICKNESS SHALL BE 40 MILS.
   B. ALL OTHER CRITERIA SAME AS FOR TYPE A HDPE LINER.
3. PPL LINER CRITERIA:
   A. MINIMUM THICKNESS SHALL BE 30 MILS.
   B. ALL OTHER CRITERIA SAME AS FOR TYPE A HDPE LINER.

Culvert & Stormsewer Bedding Detail
NO SCALE



NOTE: 3" OF ADDITIONAL CRUSHED STONE REQUIRED IN WET TRENCH AT NO ADDITIONAL COST.

Swale Detail
NO SCALE



- MIN. LONGITUDINAL SLOPE = 0.75%
- WHERE SPECIFIED, EROSION MATTING, STAKED SOD OR RIP-RAP SHALL BE A MINIMUM OF 6' WIDE CENTERED at THE SWALE

Anti-Clog Cage Detail
NO SCALE

SPECIFICATIONS:
- EXTEND 3' OUT FROM ORIFICE
- 4" MAX. OPENINGS
- ATTACH CAGE TO CONCRETE RISER FACE USING MIN (4) ⅜" TAPCONS, OR SIM.
- DETAIL AS SHOWN ABOVE OR SIMILAR

REUSE OF DOCUMENTS
THE DESIGNS AND PLANS PREPARED FOR A SPECIFIC APPLICATION AND NOT FOR USE ON OTHER PROJECTS. THEY SHALL NOT BE USED WITHOUT THE WRITTEN APPROVAL OF BAUDHUIN SURVEYING & ENGINEERING. ANY USE OF THESE DESIGNS SHALL BE THE SOLE RESPONSIBILITY OF THE UNAUTHORIZED USER.

BAUDHUIN SURVEYING & ENGINEERING
312 N. 5TH AVE.
P.O. BOX 105
STURGEON BAY, WI.
54235
PHONE: 920-743-6211

PROJECT DIRECTORY
PLANS PREPARED BY: Jonathan Baudhuin
PLAN RANGE DATE: 12-5-19
REVISED DATE: 12-20-19
DRAWN BY: JEL
SCALE: AS NOTED
DESIGNED BY: JEL
DATE: 8-1-19
JOB NO. 2018

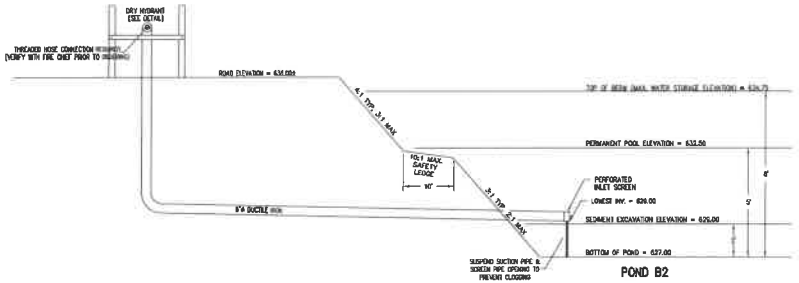
Quarry Bluff

CONSTRUCTION DETAILS

C201

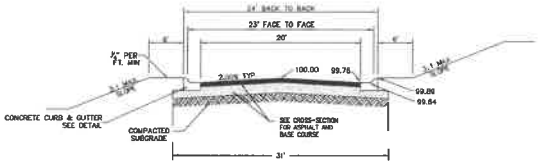
Dry Hydrant Suction Line Detail

NO SCALE



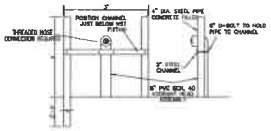
Curbed Street Section

NO SCALE



Dry Hydrant Detail

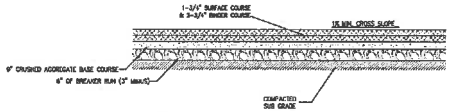
NO SCALE



NOTES:
-ELEVATION AND EXACT PLACEMENT TO BE REVIEWED WITH FIRE CHIEF PRIOR TO INSTALLATION.
- MATERIAL TO BE VERIFIED BY FIRE DEPARTMENT.

Road & Parking Lots Cross-Section

NO SCALE



NOTE:

THE ASPHALTIC BASE AND SURFACE COURSE SHOULD BE PLACED AND PROVIDED IN ACCORDANCE WITH SECTION 455/460 OF THE STATE OF WISCONSIN STANDARD SPECIFICATION FOR HIGHWAY AND STRUCTURE CONSTRUCTION. THE CRUSHED AGGREGATE BASE COURSE SHALL BE PROVIDED AND PLACED IN ACCORDANCE WITH SECTION 301/305 OF THE STANDARD SPECIFICATION.

NOTE:

ALL BACK FILL IN EXISTING OR PROPOSED ROADS SHALL BE COMPACTED TO 95% STANDARD PROCTOR.

BEDDING MATERIAL SHALL BE CRUSHED STONE CHIPS MEETING THE FOLLOWING GRADATION REQUIREMENTS:

SIEVE SIZES	PERCENTAGE PASSING BY WEIGHT
1-INCH	100
3/4 INCH	90-100
3/8 INCH	20-55
No. 4	0-10
No. 8	0-5

COVER MATERIAL SHALL CONSIST OF UNWASHED BANK-RUN SAND OR CRUSHED BANK-RUN GRAVEL. THIS MATERIAL SHALL SUBSTANTIALLY CONFORM TO THE TO THE FOLLOWING GRADATION REQUIREMENTS.

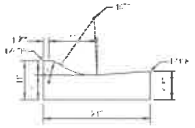
SIEVE SIZES	PERCENTAGE PASSING BY WEIGHT
1-INCH	100
3/4 INCH	60-100
3/8 INCH	50-80
No. 4	35-65
No. 40	15-30
No. 200	5-15

GRANULAR MATERIAL SHALL CONSIST OF UNIFORM GRADED DURABLE PARTICLES. SUFFICIENT FINE MATERIAL SHALL BE PRESENT TO FILL ALL THE VOIDS OF THE COURSE MATERIAL. SOME FINE CLAY OR LOAM PARTICLES ARE DESIRABLE, BUT THEY SHALL NOT BE PRESENT IN THE FORM OF LUMPS. GRANULAR BACK FILL SHALL CONFORM TO THE FOLLOWING GRADATION REQUIREMENTS:

SIEVE SIZES	PERCENTAGE PASSING BY WEIGHT
2-INCH	90-100
No. 4	85-60
Finer than No. 200	35-65

Concrete Curb and Gutter

NO SCALE



Mountable Concrete Curb & Gutter

(THROUGHOUT DEVELOPMENT)

DET.

REUSE OF DOCUMENTS
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312 N. 5TH AVE.
P.O. BOX 105
STURGEON BAY, WI.
54235
PHONE: 920-743-5211

PROJECT DIRECTORY
PLAN NAME: 08-426
PLANS DATE: 12-3-19
SCALE: AS NOTED

DRAWN BY: MJB
DESIGNED BY: MJB
DATE: 8-1-19
JOB NUMBER: 2208

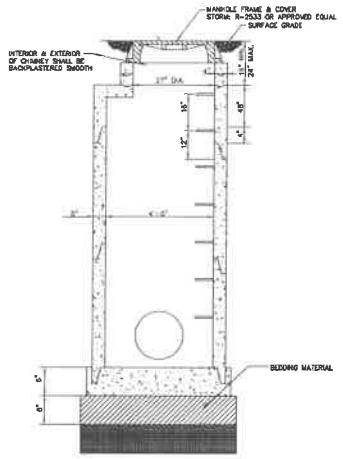
Quarry Bluff

CONSTRUCTION DETAILS

C202

Standard Precast Storm Manhole

NO SCALE



Notes

FLAT TOP DECK MAY BE USED FOR 5'-0" AND 6'-0" DIAMETER MAN HOLES.

PRECAST CONCRETE ADJUSTING RINGS TO BE REINFORCED WITH ONE HOOP OF STEEL CENTERED WITHIN THE RING WHERE NECESSARY. RINGS CAST SHALL BE GROOVED TO RECEIVE STEP.

CONCRETE AND STEEL REINFORCEMENT SHALL CONFORM TO DESIGNATION C-478 REQUIREMENTS OF ASTM SPECIFICATIONS.

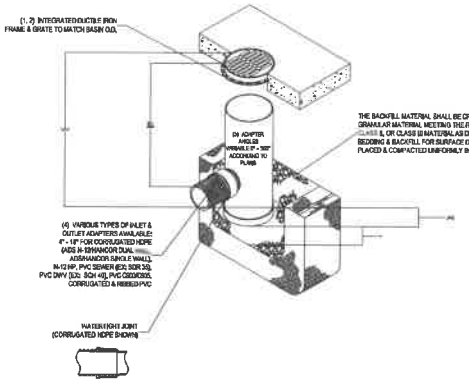
JOINTS SHALL BE WATERTIGHT AND SHALL BE MADE USING RUBBER GASKETS OR BUTYL RUBBER MASTIC MATERIAL AREA OF CIRCUMFERENTIAL STEEL = .12 SQ. INCH PER LINEAL FOOT

6" OF BEDDING MATERIAL REQUIRED UNDER BASE. MANHOLES TO BE BACKFILLED WITH GRANULAR BACKFILL MATERIAL.

24" Yard Drain Detail

Use Nyloplast Drain Basin or approved equal

NO SCALE

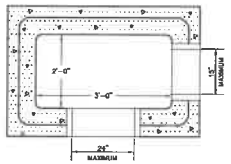


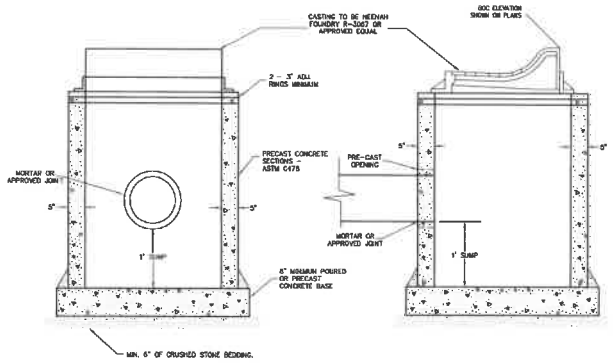
1 - CAST IRON GRATE AND FRAME SHALL BE DUCTILE IRON PER ASTM A536 GRADE 70-50-05.
2 - FRAMES SHALL BE DUCTILE IRON PER ASTM A536 GRADE 70-50-05.
3 - DRAIN BASIN TO BE CUSTOM MANUFACTURED ACCORDING TO NYLOPLAST DRAIN BASIN DETAIL DRAWING #D_TDA1112DB. RISERS ARE RIBBED FOR BASINS OVER 24" DUE TO SHIPPING RESTRICTIONS.
4 - DRAINAGE CONNECTION STUB JOINT TIGHTNESS SHALL CONFORM TO ASTM D3212 FOR CORRUGATED HDPE (ADS N-12 WATERTIGHT WALL), N-12 HP, & PVC PIPE.
5 - ADAPTERS CAN BE MOUNTED ON ANY ANGLE 0° TO 360°. TO DETERMINE MINIMUM ANGLE BETWEEN ADAPTERS SEE DRAWING NO. PST-1112.

GRATE OPTIONS	LOAD RATING	PART #	DRAWING #
SOLID COVER	300 LBS (4.5)	1996000P	PST-1112-SC
	600 LBS (9.0)	1996100S	PST-1112-SC
SOLID COVER	900 LBS (13.5)	1996200S	PST-1112-SC
		1996300P	PST-1112-SC
DROP IN GRATE	HEAVY DUTY	1996300	PST-1112-DIG

Catch Basin

NO SCALE





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312 N. 5TH AVE.
P.O. BOX 105
STURGEON BAY, WI.
54235
PHONE: 920-743-6211

DRAWN BY: MWB
CHECKED BY: PJL
DATE: 12-3-19
JOB NUMBER: 2000

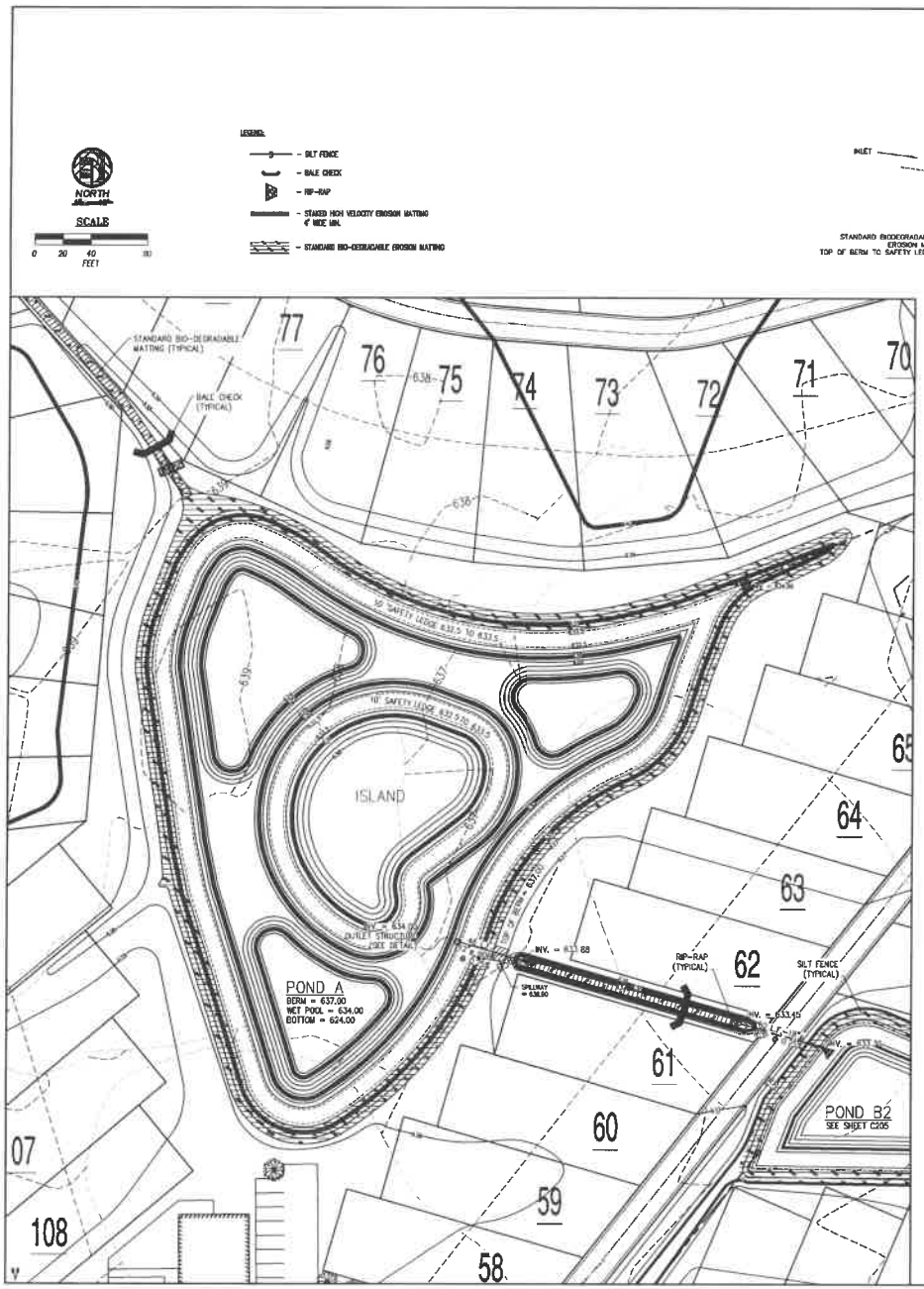
PLAN: Preliminary Plat
PLAN NAME: 06-1515
PROJECT DIRECTORY: Developer
REVISED DATE: 12-3-19
SCALE: AS NOTED

Quarry Bluff

CONSTRUCTION DETAILS

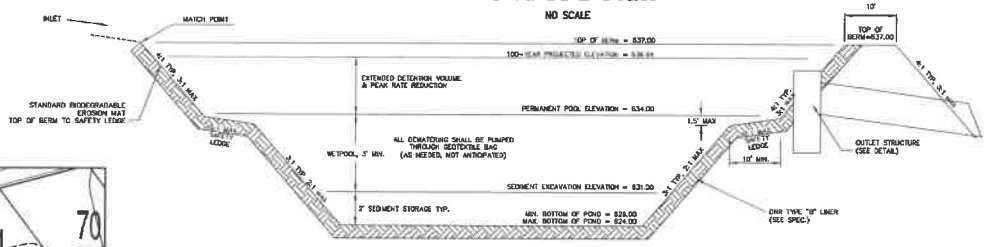
C203

RELEASE OF DOCUMENTS
THE DOCUMENTS ARE RELEASED FOR A SPECIFIC APPLICATION AND NOT FOR USE ON OTHER PROJECTS. THEY ARE NOT TO BE USED WITHOUT THE WRITTEN APPROVAL OF BAUDHUIN SURVEYING & ENGINEERING, INC. AND ITS USE IS THE SOLE RESPONSIBILITY OF THE UNAUTHORIZED USER.



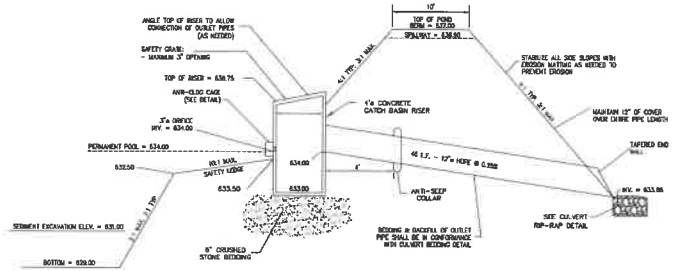
Pond A Detail

NO SCALE



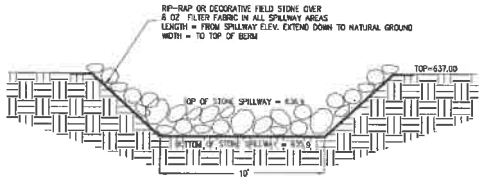
Pond A Outlet Structure Detail

NO SCALE



Pond A Spillway Detail

NO SCALE



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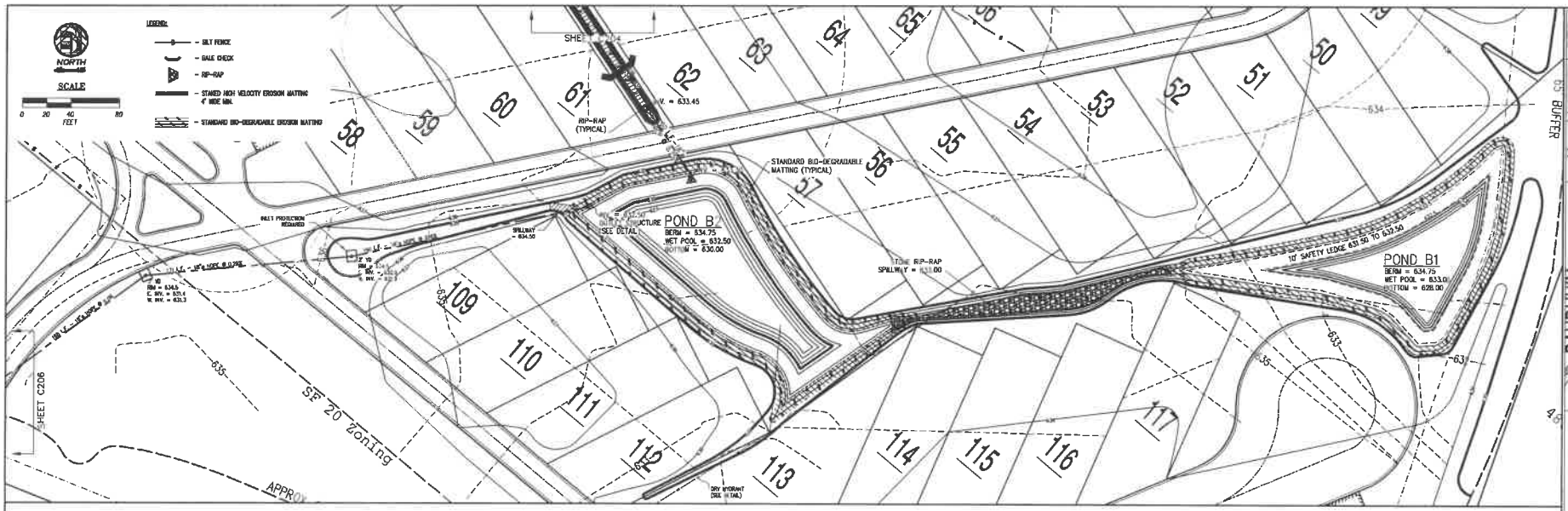
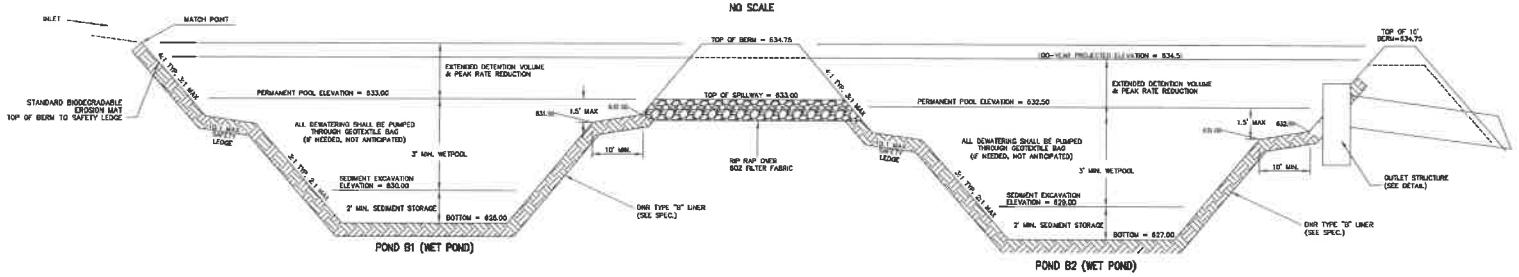
POND A DETAILS

C204



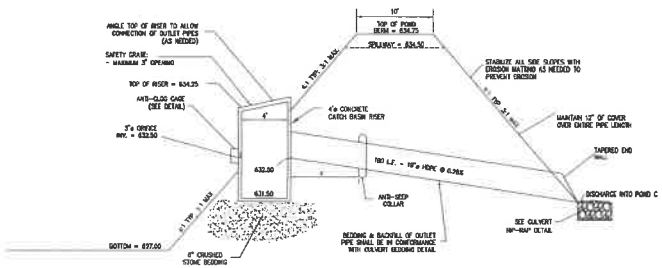
Pond B Detail

NO SCALE



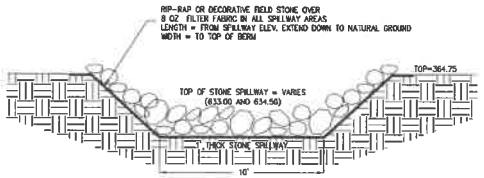
Pond B Outlet Structure Detail

NO SCALE



Pond B Spillway Detail

NO SCALE



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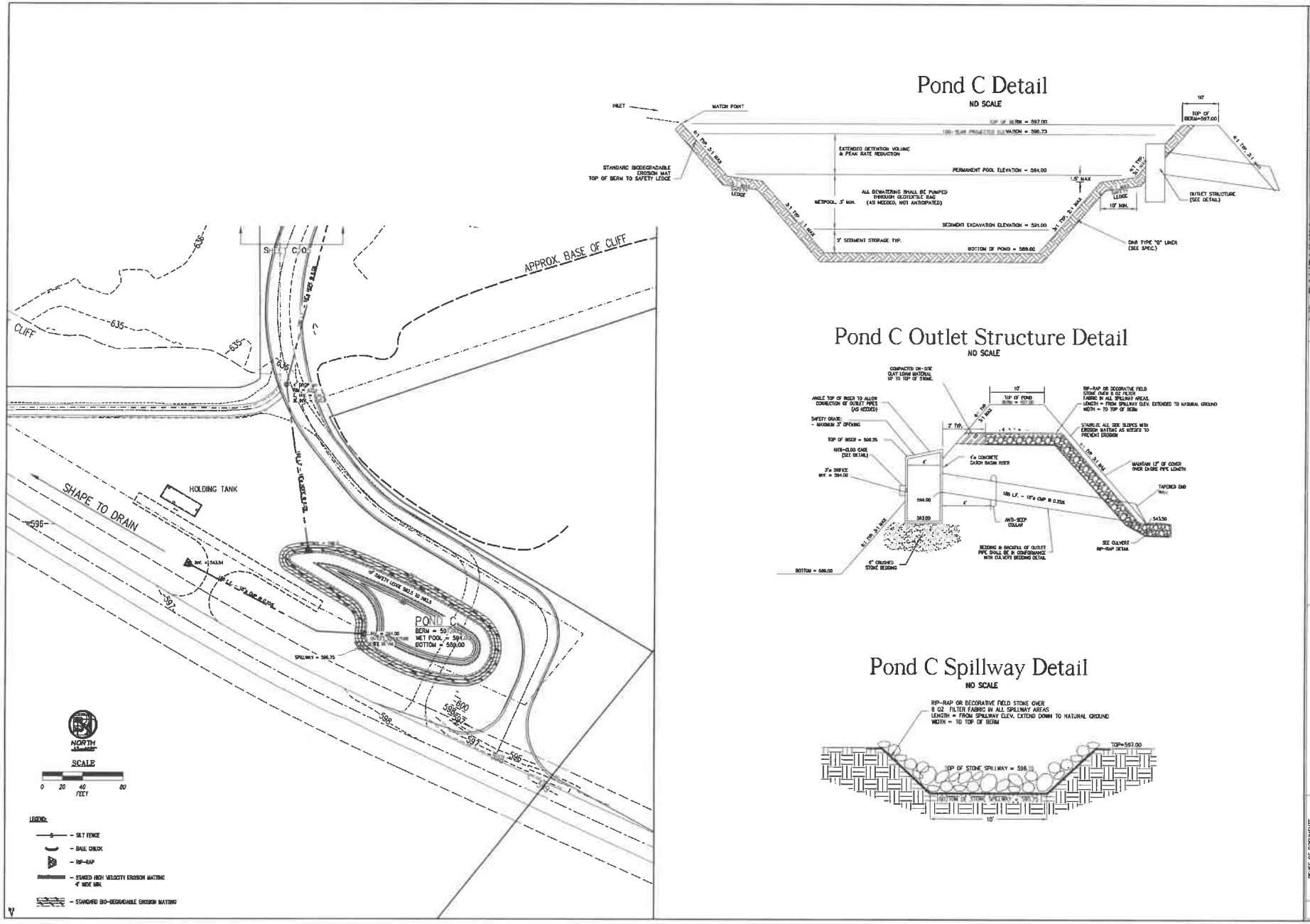
POND B DETAILS

REUSE OF DOCUMENTS

C205


Pond C Detail
NO SCALE
INLET
MATCH POINT
TOP OF BERM = 597.00
EXTENDED DETENTION VOLUME & PEAK RATE REDUCTION
PERMANENT POOL ELEVATION = 594.00
STANDARD BIODEGRADABLE EROSION MAT TOP OF BERM TO SAFETY LEDGE
ALL DEWATERING SHALL BE PUMPED THROUGH GEOTEXTILE BAG (AS NEEDED, NOT ANTICIPATED)
WETPOOL, 3' MIN.
SEDIMENT EXCAVATION ELEVATION = 591.00
2' SEDIMENT STORAGE TYP.
BOTTOM OF POND = 589.00
OUTLET STRUCTURE (SEE DETAIL)
DNR TYPE "B" LINER (SEE SPEC.)
Pond C Outlet Structure Detail
NO SCALE
COMPACTED ON-SITE CLAY LOAM MATERIAL 12" TO TOP OF STONE.
ANGLE TOP OF RISER TO ALLOW CORRECTION OF OUTLET PIPES (AS NEEDED)
SAFETY GRATE: - MAXIMUM 3" OPENING
TOP OF RISER = 598.25
ANTI-CLOG CAGE (SEE DETAIL)
3"ø ORIFICE INV. = 594.00
4'ø CONCRETE CATCH BASIN RISER
RIP-RAP OR DECORATIVE FIELD STONE OVER 8 OZ FILTER FABRIC IN ALL SPILLWAY AREAS. LENGTH = FROM SPILLWAY ELEV. EXTENDED TO NATURAL GROUND WIDTH = TO TOP OF BERM
STABILIZE ALL SIDE SLOPES WITH EROSION MATTING AS NEEDED TO PREVENT EROSION
MAINTAIN 12" OF COVER OVER ENTIRE PIPE LENGTH
TAPERED END
ANTI-SEEP COLLAR
BEDDING & BACKFILL OF OUTLET PIPE SHALL BE IN CONFORMANCE WITH CULVERT BEDDING DETAIL
SEE CULVERT RIP-RAP DETAIL
6" CRUSHED STONE BEDDING
BOTTOM = 589.00
Pond C Spillway Detail
NO SCALE
RIP-RAP OR DECORATIVE FIELD STONE OVER 8 OZ FILTER FABRIC IN ALL SPILLWAY AREAS LENGTH = FROM SPILLWAY ELEV. EXTEND DOWN TO NATURAL GROUND WIDTH = TO TOP OF BERM
TOP=597.00
TOP OF STONE SPILLWAY = 598.75
BOTTOM OF STONE SPILLWAY = 595.75
10'
APPROX. BASE OF CLIFF
CLIFF
SHAPE TO DRAIN
HOLDING TANK
POND C
BERM = 597.00
WET POOL = 594.00
BOTTOM = 589.00
SPILLWAY = 598.75
NORTH
SCALE
0 20 40 80
FEET
LEGEND:
- SILT FENCE
- BALE CHECK
- RIP-RAP
- STAKED HIGH VELOCITY EROSION MATTING 4' WIDE MIN.
- STANDARD BIO-DEGRADABLE EROSION MATTING
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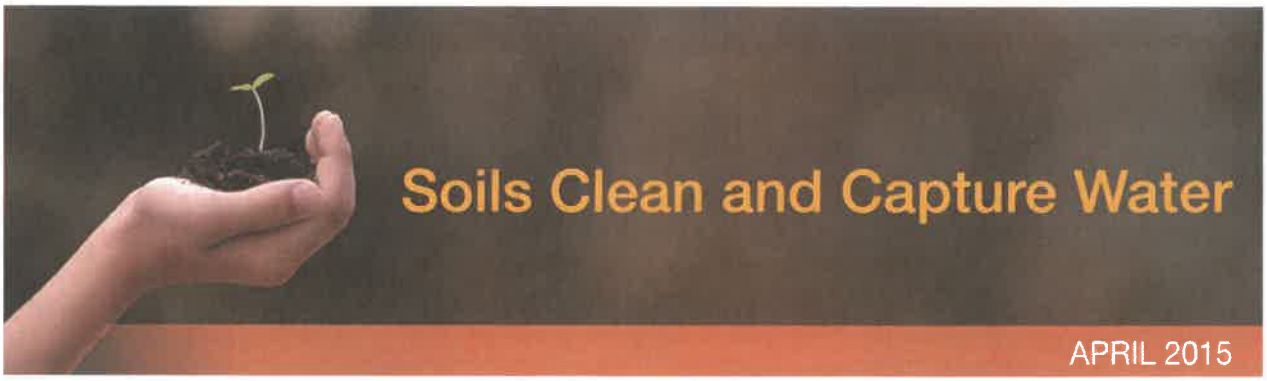
STURGEON BAY, WI.
54235
PHONE: 920-743-6211
Quarry Bluff
POND C DETAILS
C206



Soils Capture Water

Capturing water is one of the most important roles that soils play in our ecosystem. This happens through the pores in the soil. The pores of a soil are important in determining if water will move into the soil and through to groundwater. Pores can be any size from small, microscopic holes in the soil to large worm-like holes and prairie dog tunnels. Soil with lots of small pores will slow down how quickly rain enters, resulting in the potential for runoff and flooding. However, soil with lots of large pores will allow water to move through quickly. An ideal soil has both large and small pores so that some water moves through but some is stored for plants.

The size of soil pores is dictated by both soil texture and soil structure (see the January overview https://www.soils.org/files/sssa/iys/edu-materials-kit/soils-overview-for-teachers.pdf). Structure can be affected by human activity, which then affects the size of the pores. Coarse textures, like sand, generally have larger pores while fine textures, like clay, generally have smaller pores. A soil with good structure will have lots of big and small pores, even if it is clayey. A soil with poor structure, whether natural or because of erosion or compaction, will only have small pores.

Land surface cover is also important. Soil covered by plants is one of the most efficient at capturing water, (like grass and trees). Soil covered in concrete, like parking lots and buildings, will capture the least amount of water. Open lands that have been compacted also make it difficult for water to move into the soil.

Soils are Nature's Filters

Not only does soil capture water, but soil also filters water. Water that moves into and through soil is cleaned by physical, chemical, and biological processes. For example, when pollutants carried by water get caught in the small pores of the soil, they get physically cleaned. Most soils have a slight chemical charge which attracts and captures chemicals with the opposite charge. For instance, many soils (especially clayey soils) are negatively charged. Positively charged substances, such as Ammonium (a form of Nitrogen), are attracted to the soil. So, the soil holds the pollutants rather than releasing it into the groundwater. Negatively charged chemicals, such as Nitrate (another

Soil covered in concrete will capture the least amount of water. NRCS

Making a rain garden in Chicago to reduce runoff. Dan Wendt

(/) MENU

(http://www.linkedin.com/groups?
(http://[illegible]ProductsMagazine)

BY GARY M. PIERZYNSKI | JUN 03, 2015

(/#FACEBOOK) (/#TWITTER) (/#LINKEDIN)

SOIL: EARTH'S LARGEST NATURAL FILTER

Soil's benefits as a filter for a variety of contaminants

Water that enters the soil and flows downward likely will be used again by society. The most common scenario would be that the downward-flowing water recharges the groundwater reserves that are then used as a source of drinking water or for irrigation. Groundwater also often has a hydrologic connection with surface water bodies, so the characteristics of the groundwater can influence aquatic habitats in a lake or river, which then may be used as a source of drinking or irrigation water. Fortunately, soils are great water purifiers—in fact, they represent the largest natural filter on the planet. These filtration benefits are an important part of the ecosystem services provided by soil.

SECTION #12

Visual Harmony

Item #12

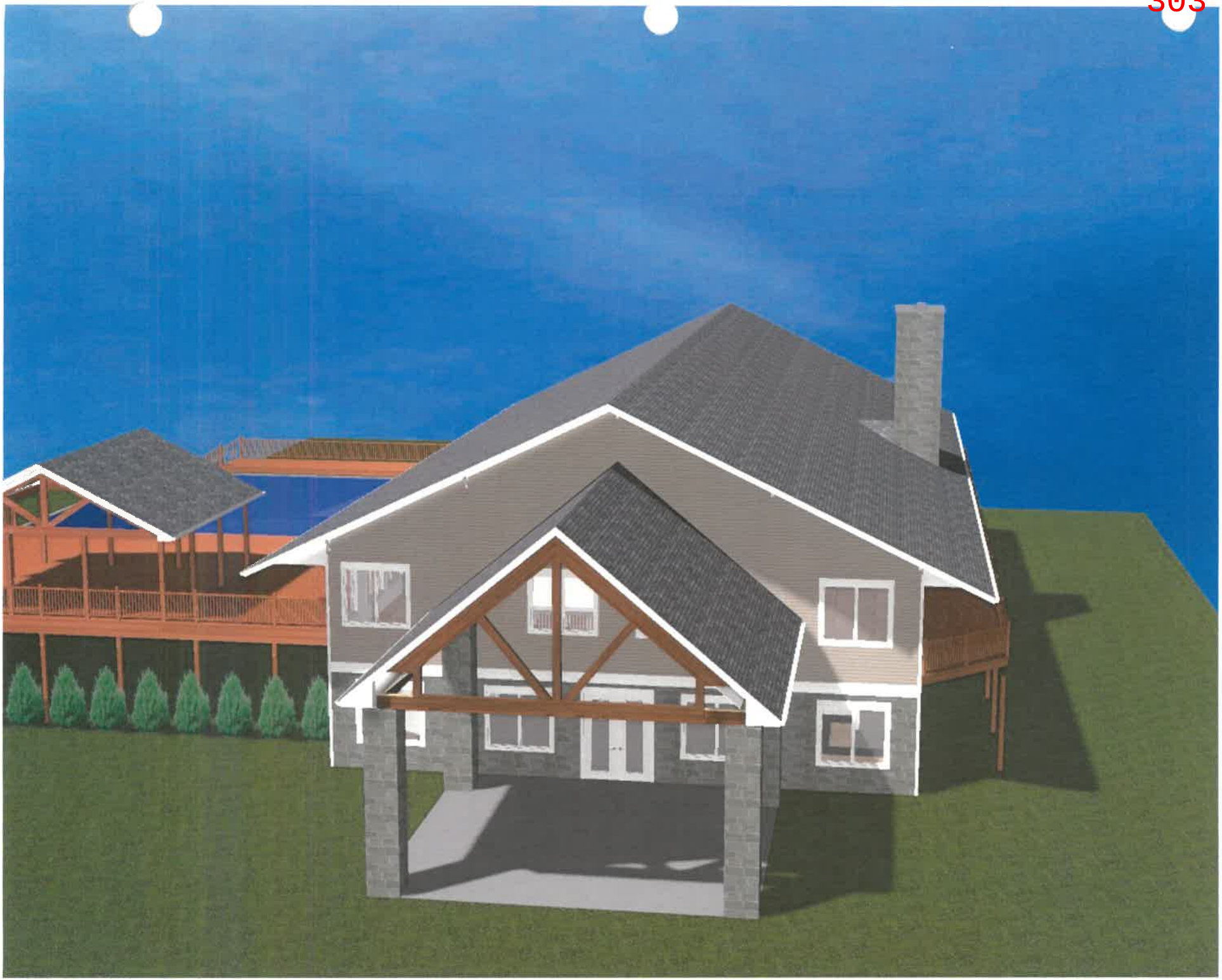
Whether Proposed Buildings Contribute to Visual Harmony with Existing Buildings in the Neighborhood, Particularly as Related to Sale and Design.

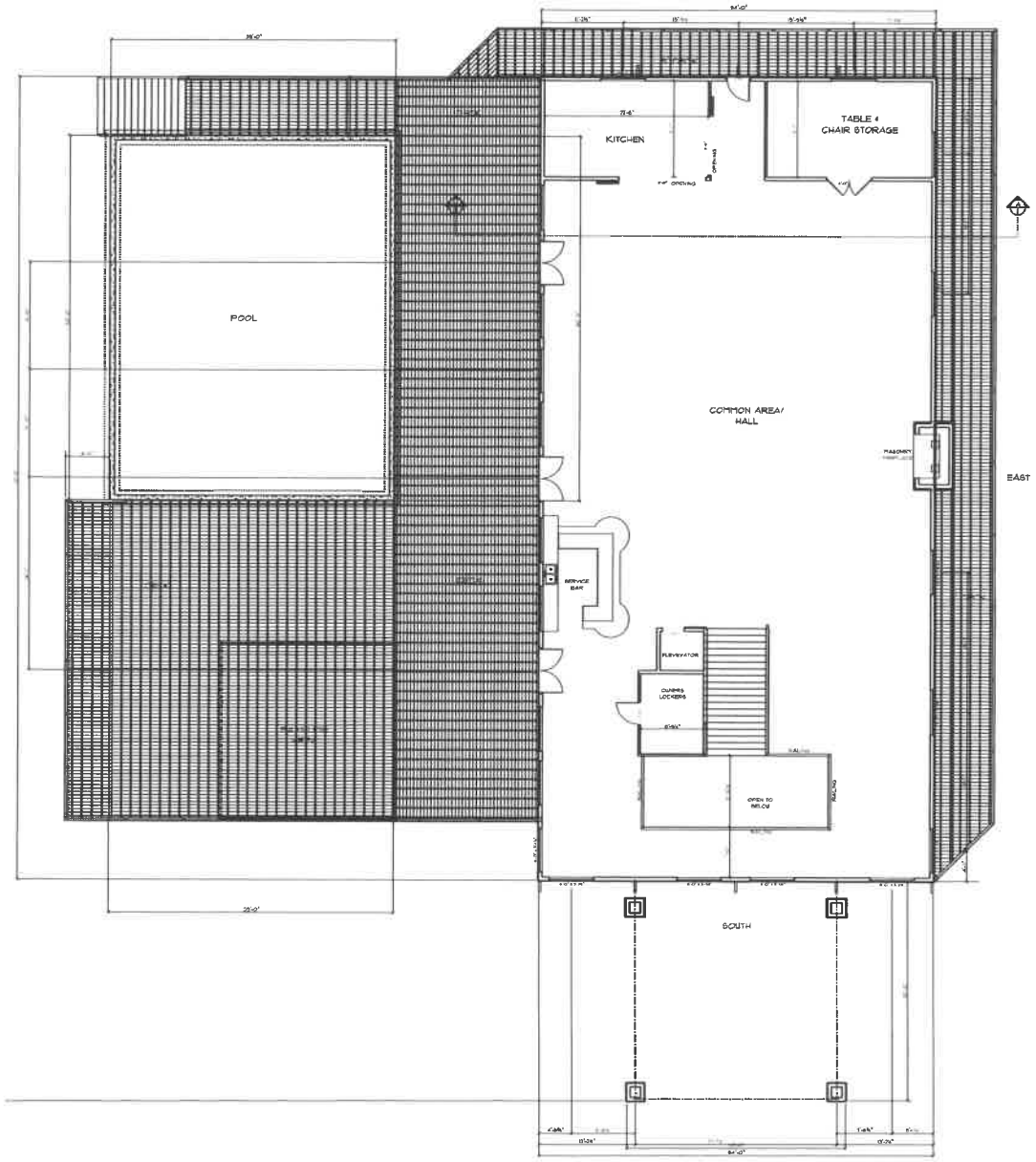
We feel that the front row (Lots one to twenty five) of homes will blend well into the geologic strata of the front cliff being built in the Prairie Style of architecture, featuring low-pitched roofs, overall angular minimalism, and employing primarily natural materials/colors on the exterior.

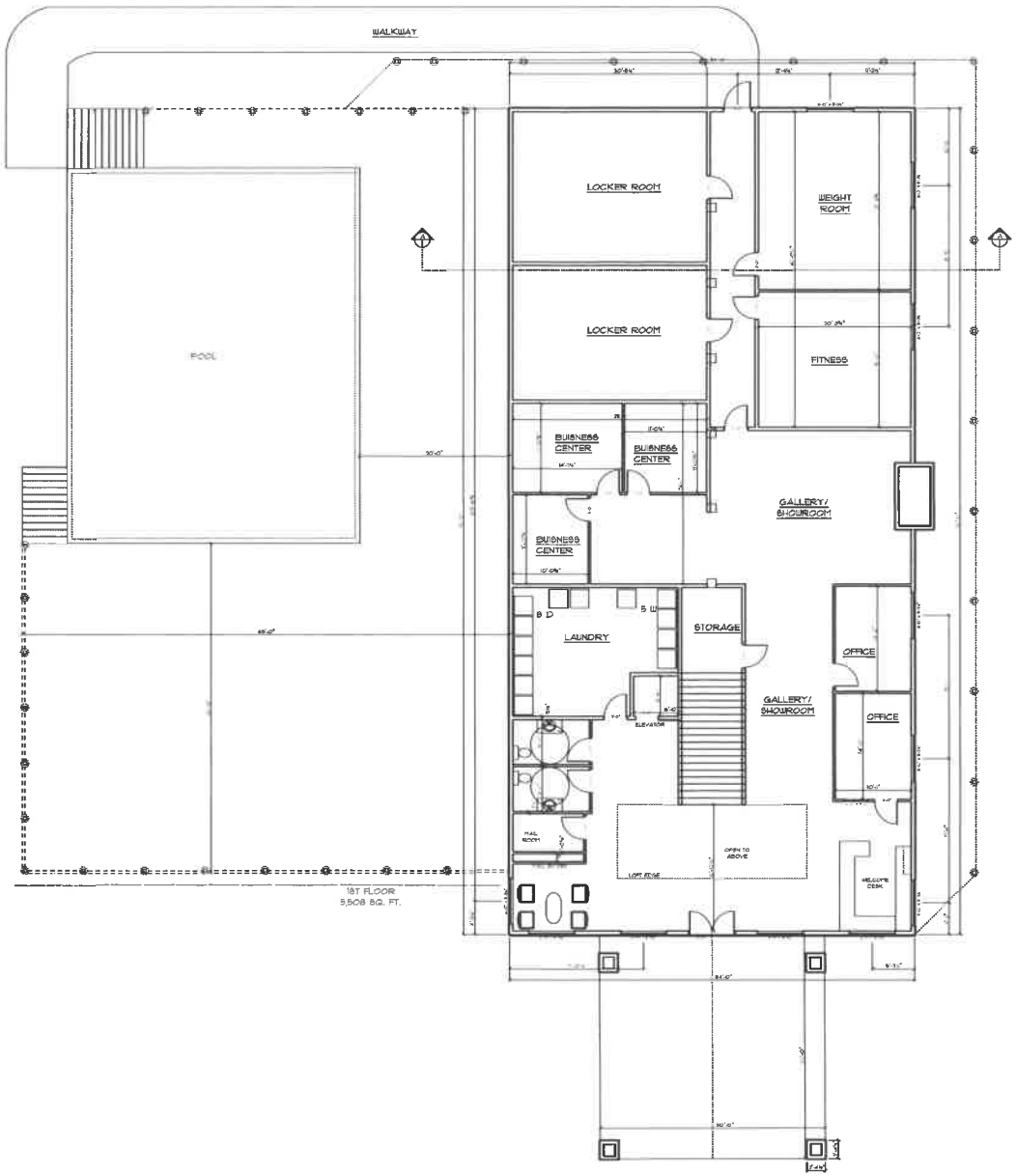
Lots 58 - 108, will likely be 2-story homes with porches and balconies. These homes will take their architectural cues from Cape Cod or Adirondack inspired designs. The size of these homes will be approximately 1,200-2,400 square feet, with additional porches, etc. The buildings will be complementary to the existing fine homes in the area.

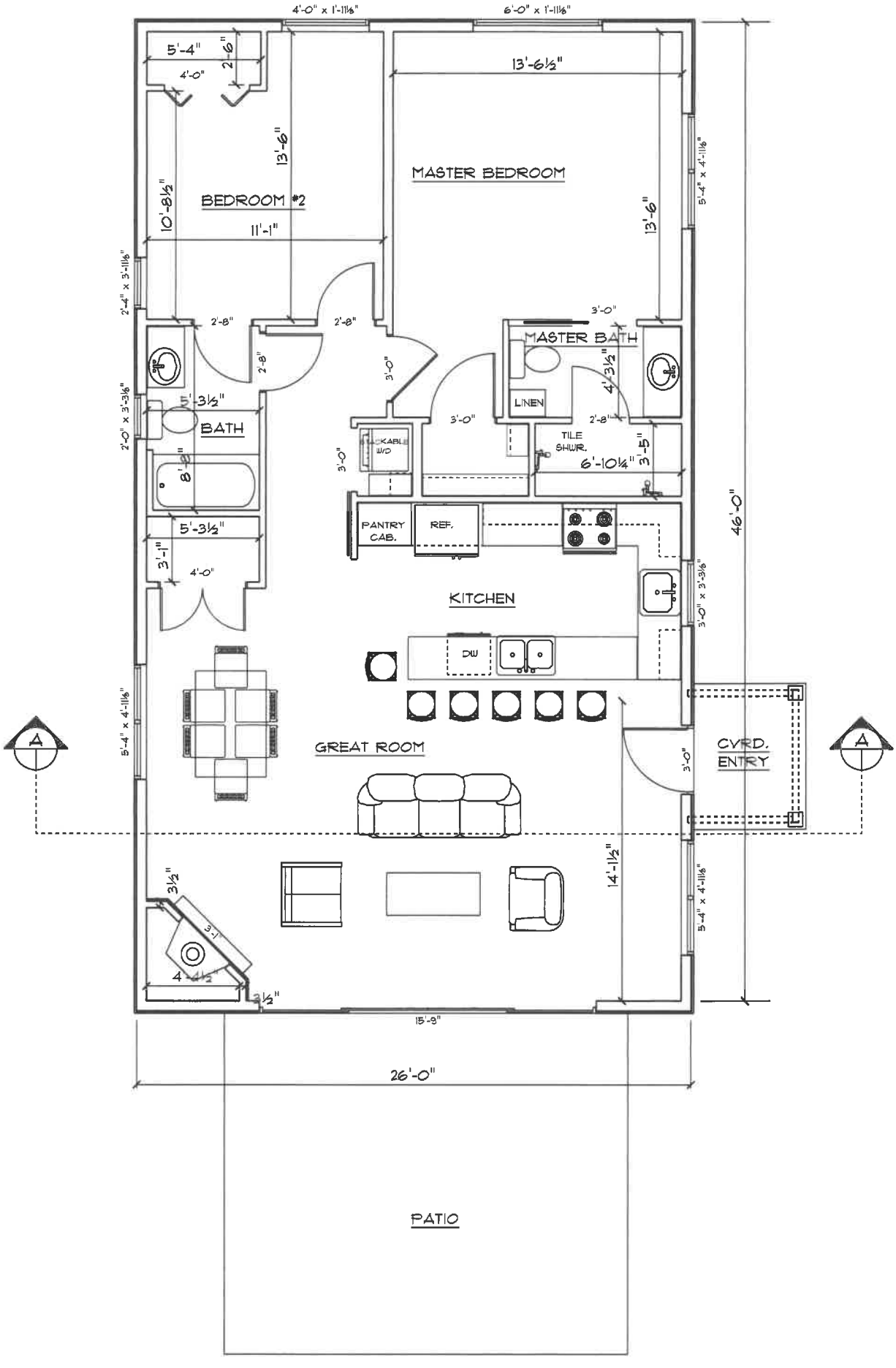
The final tier of homes is located with backyards facing the existing quarry. Many of these homes will be three story with a smaller footprint than the other plans. Obviously, the height of these homes will have to meet county zoning height limits. The design of these homes will be a Cape Cod design.

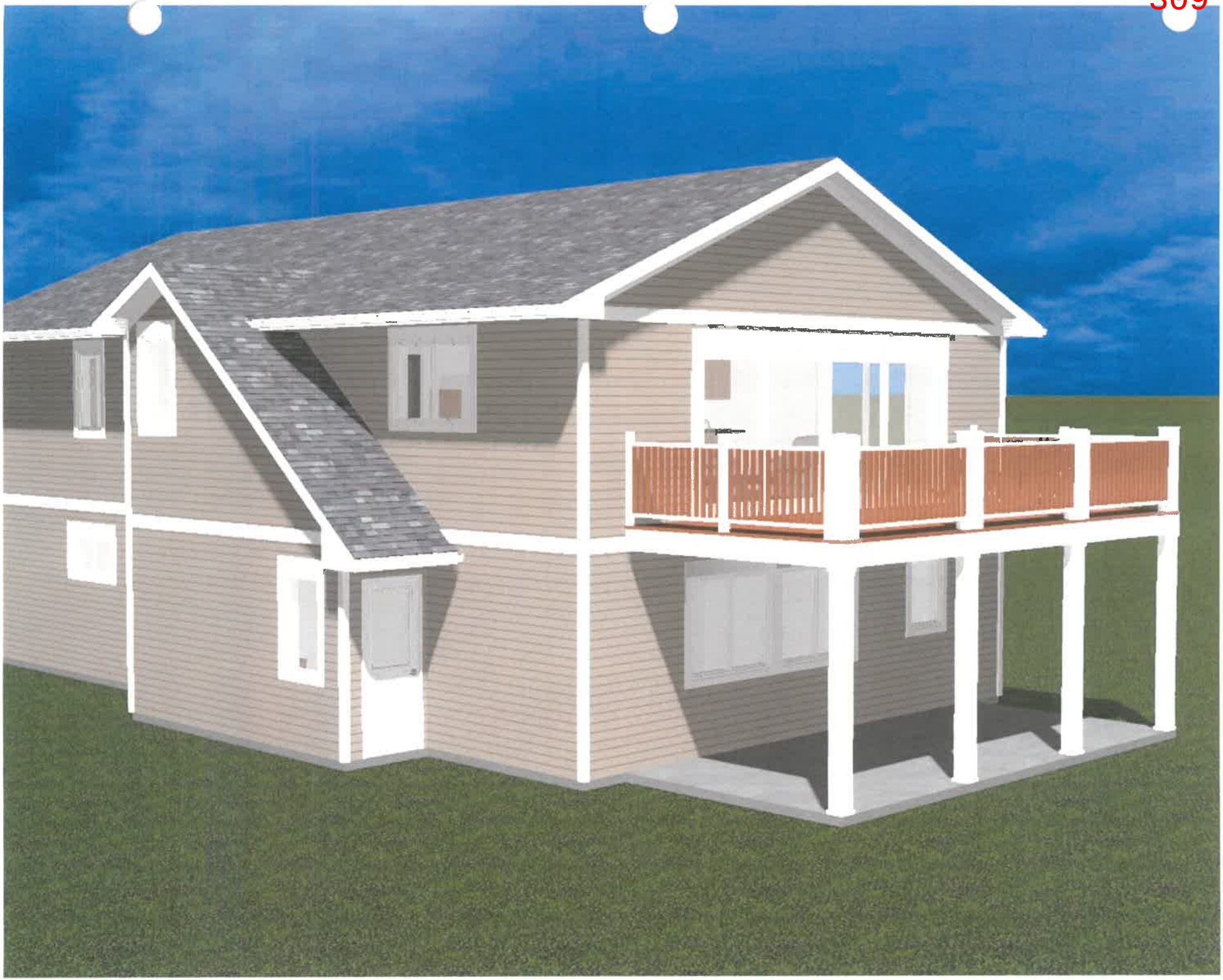
The Pavilion/clubhouse building will be 2 levels, with both levels being approximately 7,000 square feet. The design will feature cathedral-like elements and offer a strong architectural nod to Door County's Scandinavian heritage.

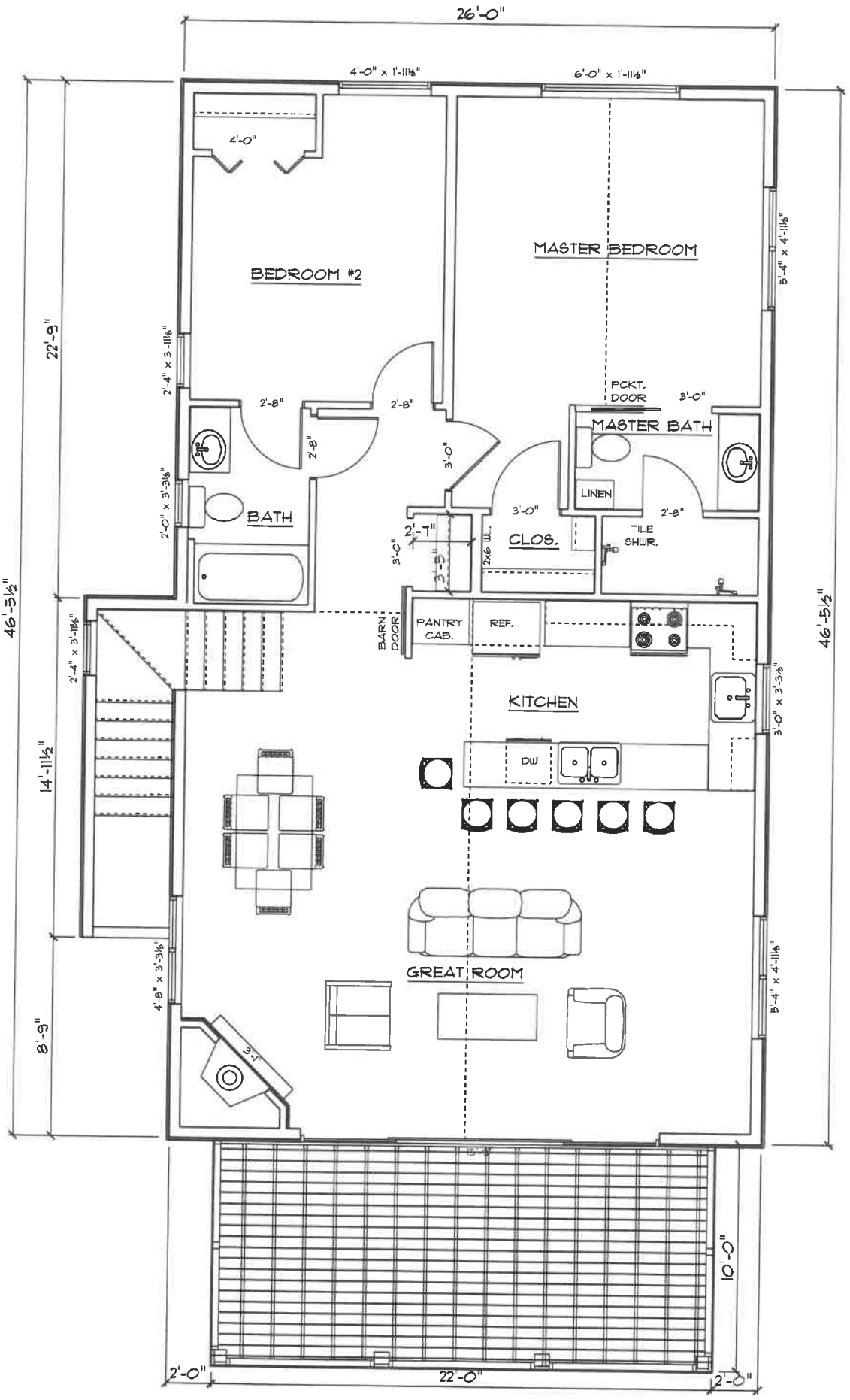


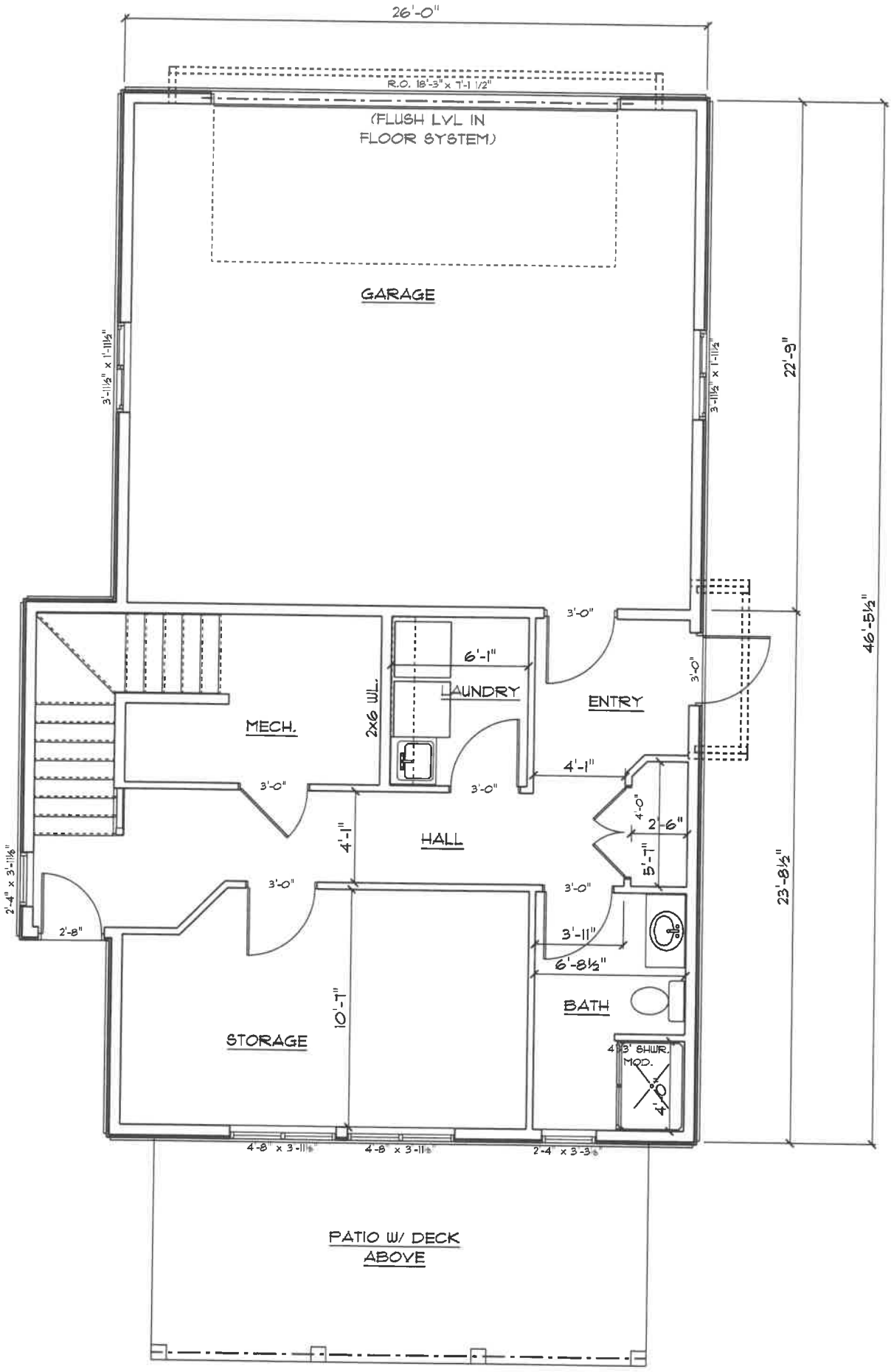

KITCHEN
TABLE &
CHAIR STORAGE
POOL
COMMON AREA/
HALL
EAST
SERVICE
BAR
ELEVATOR
LOCKERS
OPEN TO
BELOW
SOUTH

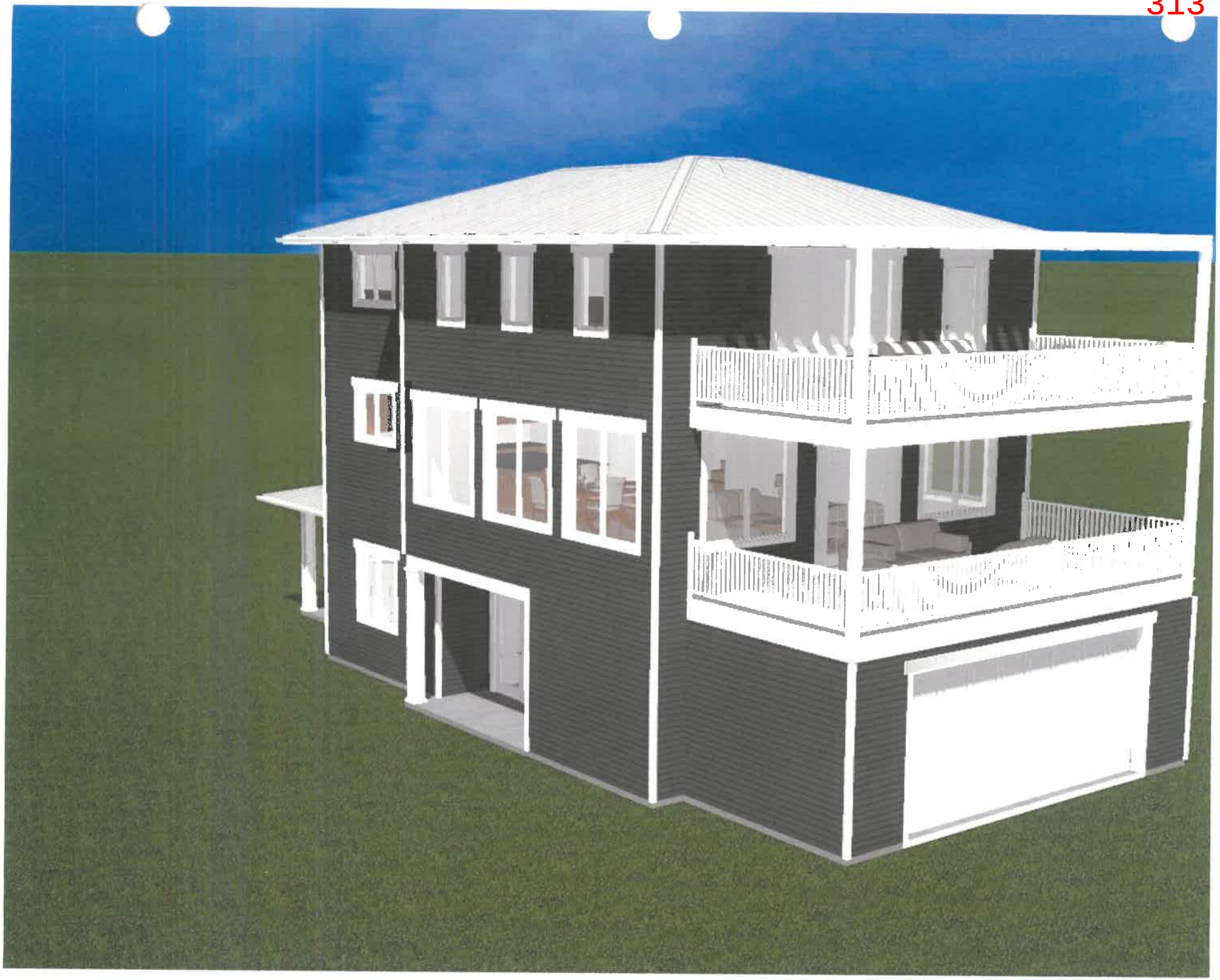

WALKWAY
POOL
LOCKER ROOM
LOCKER ROOM
WEIGHT ROOM
FITNESS
BUSINESS CENTER
BUSINESS CENTER
BUSINESS CENTER
GALLERY/ SHOWROOM
B D
S W
LAUNDRY
STORAGE
OFFICE
GALLERY/ SHOWROOM
OFFICE
MAIL ROOM
OPEN TO ABOVE
WELCOME DESK
1ST FLOOR
5,508 SQ. FT.

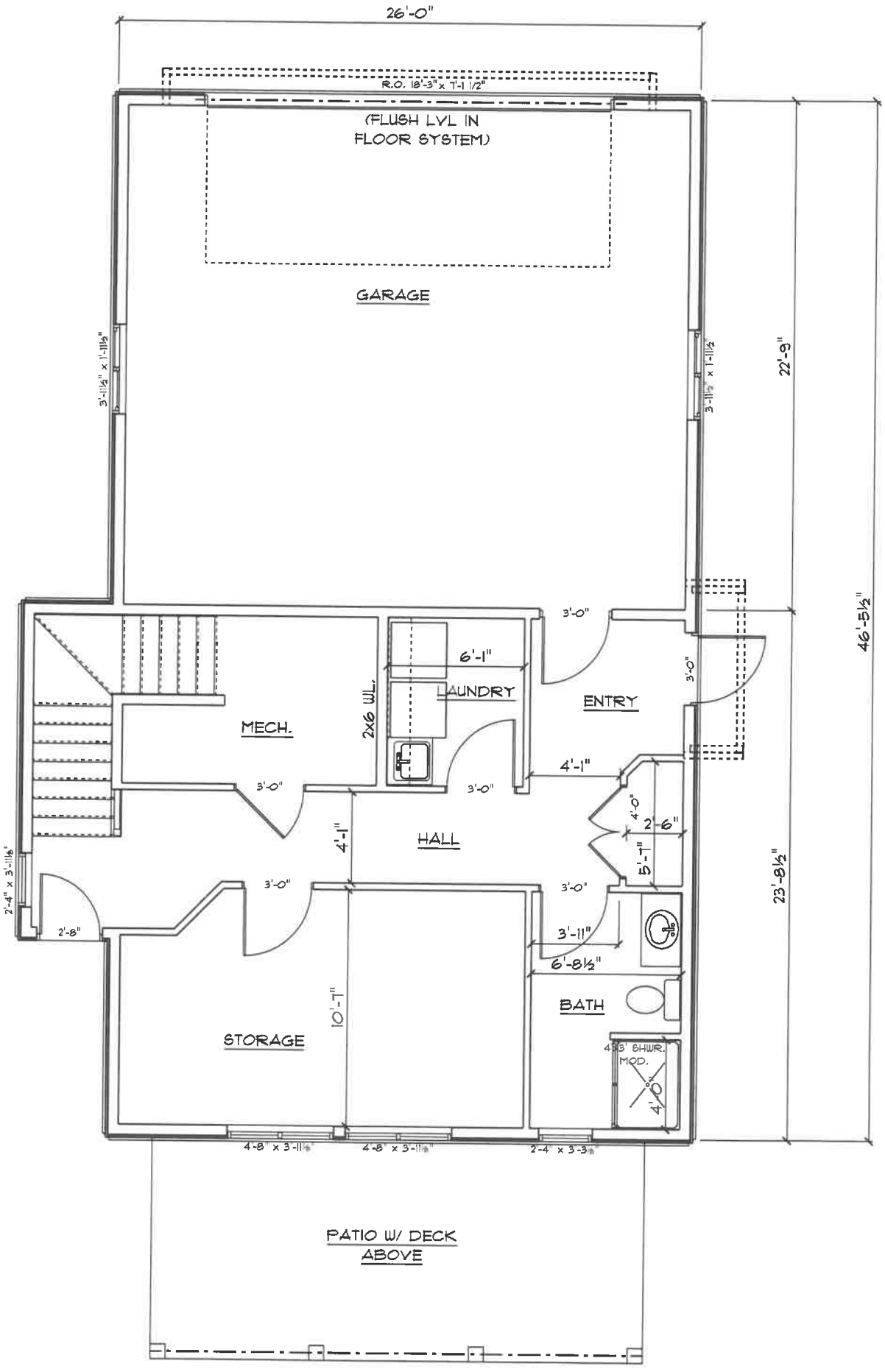

4'-0" x 1'-11⅛"
6'-0" x 1'-11⅛"
5'-4"
4'-0"
2'-6"
13'-6½"
MASTER BEDROOM
BEDROOM #2
10'-8½"
11'-1"
13'-6"
13'-6"
5'-4" x 4'-11⅛"
2'-4" x 3'-11⅛"
2'-8"
2'-8"
2'-8"
3'-0"
3'-0"
MASTER BATH
LINEN
4'-3½"
2'-8"
TILE SHWR.
6'-10¼"
3'-5"
5'-3½"
BATH
8'-9"
2'-0" x 3'-3⅛"
3'-0"
LAUNDRY W/D
PANTRY CAB.
REF.
5'-3½"
3'-1"
4'-0"
KITCHEN
DW
3'-0" x 3'-3⅛"
46'-0"
5'-4" x 4'-11⅛"
A
A
GREAT ROOM
3'-0"
CVRD. ENTRY
14'-1½"
5'-4" x 4'-11⅛"
3½"
3'-1"
4'-4½"
3½"
15'-3"
26'-0"
PATIO

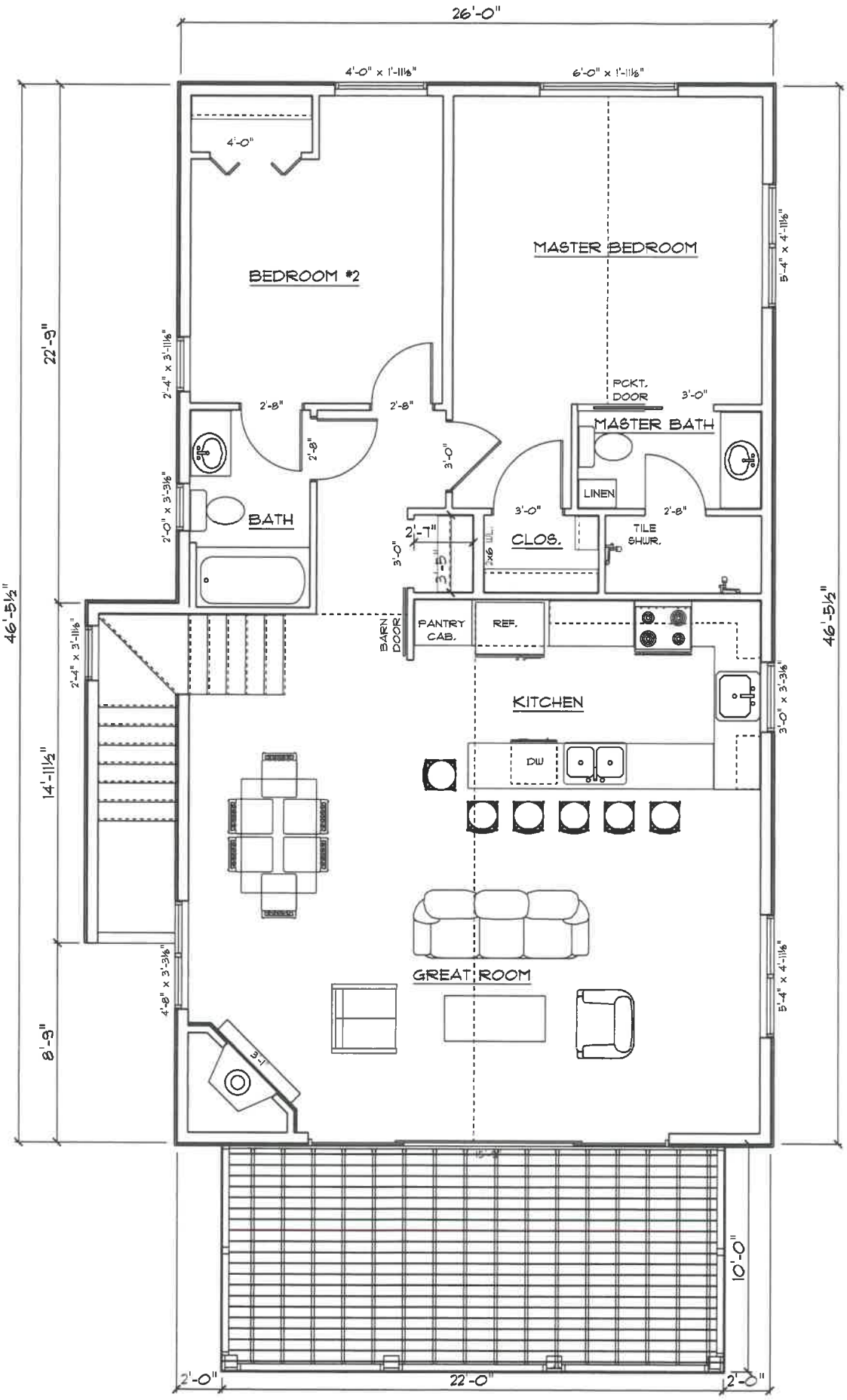



26'-0"
4'-0" x 1'-11⅛"
6'-0" x 1'-11⅛"
4'-0"
BEDROOM #2
MASTER BEDROOM
5'-4" x 4'-11⅛"
22'-9"
2'-4" x 3'-11⅛"
2'-8"
2'-8"
2'-8"
3'-0"
PCKT. DOOR
3'-0"
MASTER BATH
LINEN
2'-8"
TILE SHWR.
2'-0" x 3'-3⅛"
BATH
3'-0"
2'-1"
3'-5"
2x6 W.
CLOS.
46'-5½"
2'-4" x 3'-11⅛"
BARN DOOR
PANTRY CAB.
REF.
KITCHEN
3'-0" x 3'-3⅛"
14'-11½"
DW
4'-8" x 3'-3⅛"
GREAT ROOM
5'-4" x 4'-11⅛"
8'-9"
10'-0"
2'-0"
22'-0"
2'-0"


26'-0"
R.O. 18'-3" x 1'-1 1/2"
(FLUSH LVL IN
FLOOR SYSTEM)
GARAGE
3'-11½" x 1'-11½"
3'-11½" x 1'-11½"
22'-9"
46'-5½"
MECH.
2x6 WL.
6'-1"
LAUNDRY
ENTRY
3'-0"
3'-0"
3'-0"
3'-0"
4'-1"
4'-1"
HALL
4'-0"
2'-6"
5'-1"
3'-0"
3'-0"
2'-4" x 3'-11½"
2'-8"
3'-11"
6'-8½"
BATH
10'-1"
STORAGE
3' SHWR.
MOD.
4'-0"
4'-8" x 3'-11½"
4'-8" x 3'-11½"
2'-4" x 3'-3½"
23'-8½"
PATIO W/ DECK
ABOVE




26'-0"
R.O. 18'-3" x 7'-1 1/2"
(FLUSH LVL IN FLOOR SYSTEM)
GARAGE
3'-11½" x 1'-11½"
3'-11½" x 1'-11½"
22'-9"
46'-5½"
23'-8½"
MECH.
2x6 WL.
6'-1"
LAUNDRY
ENTRY
3'-0"
3'-0"
3'-0"
3'-0"
4'-1"
4'-1"
HALL
4'-0"
2'-6"
5'-7"
3'-0"
3'-0"
3'-11"
6'-8½"
2'-4" x 3'-11½"
2'-8"
10'-7"
STORAGE
BATH
4'-3" SHWR. MOD.
4'-0"
4-8" x 3-11½"
4-8" x 3-11½"
2-4" x 3-3½"
PATIO W/ DECK ABOVE


26'-0"
4'-0" x 1'-11⅛"
6'-0" x 1'-11⅛"
4'-0"
BEDROOM #2
MASTER BEDROOM
5'-4" x 4'-11⅛"
22'-9"
2'-4" x 3'-11⅛"
2'-8"
2'-8"
2'-8"
3'-0"
PCKT. DOOR
3'-0"
MASTER BATH
LINEN
2'-0" x 3'-3⅛"
BATH
3'-0"
2'-8"
2'-7"
3'-0"
3'-5"
2x6 WL.
CLOS.
TILE SHWR.
46'-5½"
46'-5½"
2'-4" x 3'-11⅛"
BARN DOOR
PANTRY CAB.
REF.
KITCHEN
3'-0" x 3'-3⅛"
14'-11½"
DW
GREAT ROOM
4'-8" x 3'-3⅛"
5'-4" x 4'-11⅛"
8'-9"
3-1
10'-0"
2'-0"
22'-0"
2'-0"

SECTION #13

Exterior Lighting

Item #13

Lighting -- Dark Sky

The quantity of exterior lighting will be kept to an absolute minimum. All fixtures will be Dark-Sky (International Dark-Sky Association) compliant and consistent with Dark Sky best practices. Light fixtures on the exterior of all buildings will be under the strict control of the homeowner's association. At this time no streetlights are being proposed. Any streetlights, if required, to be built with minimum height and light output, unlike the existing light structures found in Pinney Park.

The International Dark-Sky Association (IDA) is the recognized authority on light pollution and is the leading organization combating light pollution worldwide.

Our Mission

IDA's mission is to preserve and protect the nighttime environment and our heritage of dark skies through environmentally responsible outdoor lighting.

Our Goals

- Advocate for the protection of the night sky
- Educate the public and policymakers about night sky conservation
- Promote environmentally responsible outdoor lighting
- Empower the public with the tools and resources to help bring back the night

History

International Dark-Sky Association (IDA) is a 501(c)(3) (tax ID #: 74-2493011) founded in 1988, and is dedicated to protecting the night skies for present and future generations.

Light pollution – the inappropriate use of artificial light at night – is an environmental po that harms our planet and robs us of the opportunity to experience the wonder of a natu

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Today, IDA is the recognized authority for night sky protection and has taken the lead in identifying and publicizing the negative impacts of artificial light at night on human health, wildlife and climate change.

We work with the public, city planners, legislators, lighting manufacturers, parks, and protected areas to provide and implement smart lighting choices.

Our public outreach efforts provide solutions, quality education, and programs that inform audiences across the United States and throughout the world. At the local level, our mission is furthered through the work of our U.S. and international chapters representing five continents.

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Outdoor Lighting Basics

Modern society requires outdoor lighting for a variety of needs, including safety and commerce. IDA recognizes this but advocates that any required lighting be used wisely. To minimize the harmful effects of light pollution, lighting should

- Only be on when needed
- Only light the area that needs it
- Be no brighter than necessary
- Minimize blue light emissions
- Be fully shielded (pointing downward)

The illustration below provides an easy visual guide to understand the differences between unacceptable, unshielded light fixtures and those fully shielded fixtures that minimize skyglow, glare and light trespass.

Glossary of Lighting Terms

Are you looking for dark sky friendly lighting fixtures? Search our Fixture Seal of Approval database.

Types of Light

Most people are familiar with incandescent or compact fluorescent blubs for indoor lighting, but outdoor lighting usually makes use of different, more industrial, sources of light. Common light sources include low-pressure sodium ("LPS"), high-pressure sodium ("HPS"), metal halide and light emitting diodes ("LEDs").

LPS is very energy efficient but emits only a narrow spectrum of pumpkin-colored light t some find to be undesirable. Yet, LPS is an excellent choice for lighting near astronomi

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observatories and in some environmentally sensitive areas.

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colored light, its coloring is more "true to life" than that of LPS.

In areas where it's necessary to use white light, two common choices are metal halide and LEDs. One of the advantages of LED lighting is that it can be dimmed. Thus, instead of always lighting an empty street or parking lot at full brightness, LEDs can be turned down, or even off, when they aren't needed and then brought back to full brightness as necessary. This feature both saves on energy and reduces light pollution during the night.

Because of their reported long life and energy efficiency, LEDs are rapidly coming into widespread use, replacing the existing lighting in many cities. However, there are important issues to consider when making such a conversion. See our LED Practical Guide for more information.

Color Matters

As the illustration above, it is crucial to have fully shielded lighting, but we now know that the color of light is also very important. Both LED and metal halide fixtures contain large amounts of blue light in their spectrum. Because blue light brightens the night sky more than any other color of light, it's important to minimize the amount emitted. Exposure to blue light at night has also been shown to harm human health and endanger wildlife. IDA recommends using lighting that has a color temperature of no more than 3000 Kelvins.

Lighting with lower color temperatures has less blue in its spectrum and is referred to as being "warm." Higher color temperature sources of light are rich in blue light. IDA recommends that only warm light sources be used for outdoor lighting. This includes LPS, HPS and low-color-temperature LEDs. In some areas, the white light of even a low-color-temperature LED can be a threat to the local nighttime environment. In those cases, LPS or narrow-spectrum LEDs are preferred choices.

Finding What You Need

IDA doesn't sell dark sky friendly lighting, but our Fixture Seal of Approval program makes it easy for you to find the right products. The FSA program certifies dark sky friendly outdoor lighting – these are fixtures that are fully shielded and have low color temperature. Search our database and then check with your local retailer.

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Model Lighting Laws & Policy

LED Practical Guide

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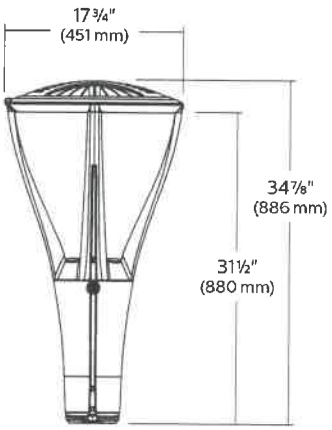
MPTC UrbanScape LED Post Top

Urban Luminaire

Dimensions



EPA: 1.7 sq ft
Weight: 32.2 lbs (14.6 kg)

Motion Response* (must be ordered as a separate item)

Example: ACC-120-MR4PG1-BKTX

Series	Voltage	Motion Response module	Finish
ACC			
ACC Accessory	**120** 120 volt **277** 120 volt	**MR4PG1** Single grey **MR4PG2** Double grey **MR4PW1** Single white **MR4PW2** Double white	Consult Lumec's Color Chart for complete specifications.

*OVR option is required for Motion Response Accessory

LED Wattage and Lumen Values for 3000K & 4000K fixtures

Ordering Code:	Total LEDs	System current (mA)	Average System Watts[1] (W)	LE2			LE3			LE3W			LE4			LE5		
				Lumen Output[2]	Efficacy (LPW)	BUG Rating	Lumen Output[2]	Efficacy (LPW)	BUG Rating	Lumen Output[2]	Efficacy (LPW)	BUG Rating	Lumen Output[2]	Efficacy (LPW)	BUG Rating	Lumen Output[2]	Efficacy (LPW)	BUG Rating
MPTC 3000K																		
35W32LED3K-G2	32	350	37	2875	77.7	B1-U0-G1	2895	78.2	B1-U0-G1	2948	79.7	B1-U0-G1	2893	78.2	B1-U0-G1	3107	84.0	B2-U0-G1
55W32LED3K-G2	32	530	56	4124	73.8	B1-U0-G1	4152	74.3	B1-U0-G1	4228	75.6	B1-U0-G1	4149	74.2	B1-U0-G1	4457	79.7	B3-U0-G1
72W32LED3K-G2	32	700	70	5201	74.0	B1-U0-G1	5237	74.5	B1-U0-G1	5333	75.9	B1-U0-G2	5233	74.4	B1-U0-G2	5621	80.0	B3-U0-G1
97W32LED3K-G2	32	1050	104	7172	68.8	B1-U0-G1	7221	69.2	B1-U0-G2	7353	70.5	B1-U0-G2	7216	69.2	B1-U0-G2	7751	74.3	B3-U0-G2
55W48LED3K-G2	48	350	54	4313	79.3	B1-U0-G1	4342	79.8	B1-U0-G1	4422	81.3	B1-U0-G1	4339	79.8	B1-U0-G1	4661	85.7	B3-U0-G1
80W48LED3K-G2	48	530	81	6186	76.1	B1-U0-G1	6229	76.6	B1-U0-G2	6342	78.0	B1-U0-G2	6224	76.6	B1-U0-G2	6686	82.2	B3-U0-G2
108W48LED3K-G2	48	700	105	7802	74.0	B1-U0-G1	7855	74.5	B1-U0-G2	7999	75.9	B1-U0-G2	7850	74.5	B1-U0-G2	8432	80.0	B3-U0-G2
140W48LED3K-G2	48	1050	157	10758	68.7	B2-U0-G2	10832	69.2	B2-U0-G2	11030	70.5	B2-U0-G2	10824	69.2	B2-U0-G2	11627	74.3	B4-U0-G2
70W64LED3K-G2	64	350	73	5750	78.8	B1-U0-G1	5790	79.3	B1-U0-G1	5896	80.8	B1-U0-G2	5785	79.2	B1-U0-G2	6215	85.1	B3-U0-G1
110W64LED3K-G2	64	530	105	8248	78.6	B2-U0-G2	8305	79.1	B1-U0-G2	8457	80.5	B1-U0-G2	8299	79.0	B1-U0-G2	8914	84.9	B3-U0-G2
90W80LED3K-G2	80	350	91	7188	79.3	B1-U0-G1	7237	79.8	B1-U0-G2	7370	81.3	B1-U0-G2	7232	79.7	B1-U0-G2	7768	85.6	B3-U0-G2
135W80LED3K-G2	80	530	136	10310	76.1	B2-U0-G2	10381	76.6	B2-U0-G2	10571	78.0	B2-U0-G2	10373	76.6	B2-U0-G2	11143	82.2	B4-U0-G2
MPTC 4000K																		
35W32LED4K-G2	32	350	37	3462	93.6	B1-U0-G1	3624	97.9	B1-U0-G1	3610	97.6	B1-U0-G1	3650	98.6	B1-U0-G1	3695	99.9	B3-U0-G1
55W32LED4K-G2	32	530	56	4966	88.8	B1-U0-G1	5198	93.0	B1-U0-G1	5178	92.6	B1-U0-G2	5235	93.6	B1-U0-G2	5300	94.8	B3-U0-G1
72W32LED4K-G2	32	700	70	6263	89.1	B1-U0-G1	6556	93.3	B1-U0-G2	6531	92.9	B1-U0-G2	6603	93.9	B1-U0-G2	6684	95.1	B3-U0-G2
97W32LED4K-G2	32	1050	104	8636	82.8	B2-U0-G2	9040	86.7	B1-U0-G2	9005	86.3	B1-U0-G2	9105	87.3	B1-U0-G2	9217	88.4	B4-U0-G2
55W48LED4K-G2	48	350	54	5255	96.6	B1-U0-G1	5349	98.3	B1-U0-G1	5422	99.7	B1-U0-G2	5362	98.6	B1-U0-G2	5659	104.0	B3-U0-G1
80W48LED4K-G2	48	530	81	7538	92.7	B1-U0-G1	7673	94.4	B1-U0-G2	7777	95.7	B1-U0-G2	7691	94.6	B1-U0-G2	8117	99.8	B3-U0-G2
108W48LED4K-G2	48	700	105	9507	90.2	B2-U0-G2	9677	91.8	B2-U0-G2	9808	93.1	B2-U0-G2	9700	92.0	B2-U0-G2	10237	97.1	B4-U0-G2
140W48LED4K-G2	48	1050	157	13109	83.8	B2-U0-G2	13344	85.3	B2-U0-G2	13525	86.4	B2-U0-G3	13376	85.5	B2-U0-G2	14116	90.2	B4-U0-G2
70W64LED4K-G2	64	350	73	7007	96.0	B1-U0-G1	7132	97.7	B1-U0-G2	7229	99.0	B1-U0-G2	7150	97.9	B1-U0-G2	7545	103.4	B3-U0-G2
110W64LED4K-G2	64	530	105	10050	95.7	B2-U0-G2	10231	97.4	B2-U0-G2	10369	98.8	B2-U0-G2	10255	97.7	B2-U0-G2	10822	103.1	B4-U0-G2
90W80LED4K-G2	80	350	91	8759	96.6	B2-U0-G2	8916	98.3	B1-U0-G2	9036	99.6	B2-U0-G2	8937	98.5	B1-U0-G2	9431	104.0	B4-U0-G2
135W80LED4K-G2	80	530	136	12563	92.7	B2-U0-G2	12788	94.4	B2-U0-G2	12962	95.7	B2-U0-G2	12819	94.6	B2-U0-G2	13528	99.8	B4-U0-G2

Actual performance may vary due to installation variables including optics, mounting/ceiling height, dirt depreciation, light loss factor, etc.; highly recommended to confirm performance with a layout - contact Applications at signify.com/outdoorluminaires.

Note: Some data may be scaled based on tests of similar. But not identical luminaires.

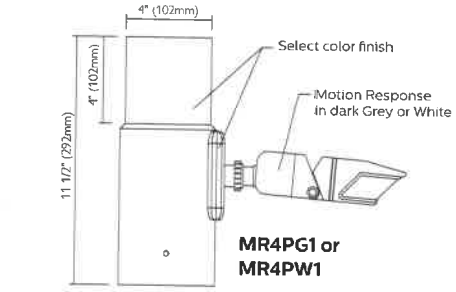
MPTC UrbanScape LED Post Top

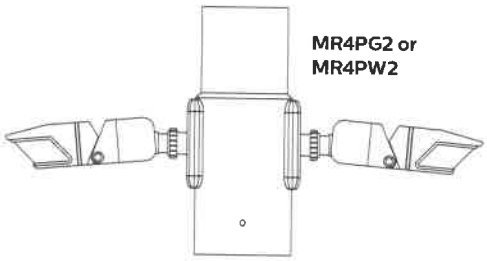
Urban Luminaire

Specifications (continued)

Luminaire accessories

Motion Response: Tenon mount motion response provides 270° coverage on an adjustable knuckle. The coverage equals to up to 6 times the sensor height. It is an option offered jointly with the Dynadimmer OVR option, that can bring the light up to 100% when the motion response is triggered. It is available in a single or double mounting option. Finish options for the motion response device are white or dark gray. Finish options for the tenon must be specified to match the luminaire and pole. The tenon mount is fully rotatable 360°. This option is available for a 4" OD x 4" long tenon. See instruction sheet for time setting functionality (12 second to 16 minute turn off options) and for mounting instructions.





Surge Protector

Surge protector tested in accordance with ANSI/IEEE C62.45 per ANSI/IEEE C62.41.2 Scenario I Category C High Exposure 10kV/10kA waveforms for Line Ground, Line Neutral and Neutral Ground, and in accordance with U.S. DOE (Department of Energy) MSSLC (Municipal Solid State Street Lighting Consortium) model specification for LED roadway luminaires electrical immunity requirements for High Test Level 10kV / 10kA.

Finish

The Thermosetting powder coating provided meets the color requirements of the AAMA 2604 specification as measured per ASTM D2244. The Thermosetting product is applied at a dry film of 2.5 to 4.0 mils (64-102 microns) on textured finishes, resulting in a durable long lasting finish.

Textured Finishes:

BE2TX: Midnight Blue
BE6TX: Ocean Blue
BE8TX: Royal Blue
BG2TX: Sandstone
BKTX: Black
BRTX: Bronze
GN4TX: Blue Green
GN6TX: Forest Green
GN8TX: Dark Forest Green
GNTX: Green
GY3TX: Medium Grey
RD2TX: Burgundy
RD4TX: Scarlet
WHTX: White

Other Finishes:

GR: Gray Sandtex
NP: Natural Alum.
TG: Hammer-tone Gold
TS: Hammer-tone Silver

LED manufacturing standard

The electronic components sensitive to electrostatic discharge (ESD) such as light emitting diodes (LEDs) are assembled in compliance with IEC61340 5 1 and ANSI/ESD S20.20 standards so as to eliminate ESD events that could decrease useful life of the product.

Quality Control

Manufactured to ISO 9001 2008 and ISO 14001 2004 International Quality Standards Certification.

Vibration Resistance

Meets the ANSI C136.31, American National Standard for Roadway Luminaire Vibration specifications for Bridge/overpass applications. (Tested for 3G over 100 000 cycles by an independent lab).

Service Tag

Each individual luminaire is uniquely identifiable, thanks to the Service tag application. With a simple scan of a QR code, placed inside the luminare, you gain instant access to the luminaire configuration, making installation and maintenance operations faster and easier, no matter what stage of the luminaire's lifetime. Just download the APP and register your product right away.

For more details visit: **signify.com/servicetag**

Certifications and Compliance

CSA, cULus Listed for Canada and USA.
MetroScape is on the DesignLights.

LED Performance

Predicted lumen depreciation data[1]					
Ordering Code	Ambient Temperature (°C)	Driver mA	Calculated L_{70} hours[1,2]	L_{70} per TM-21[2,3]	Lumen Maintenance % @ 60,000 hours
MPTC-135W80LED4K	25°C	530 mA	>100,000	>60,000	94.01%
MPTC-140W48LED4K	25°C	1050 mA	>100,000	>60,000	96.78%

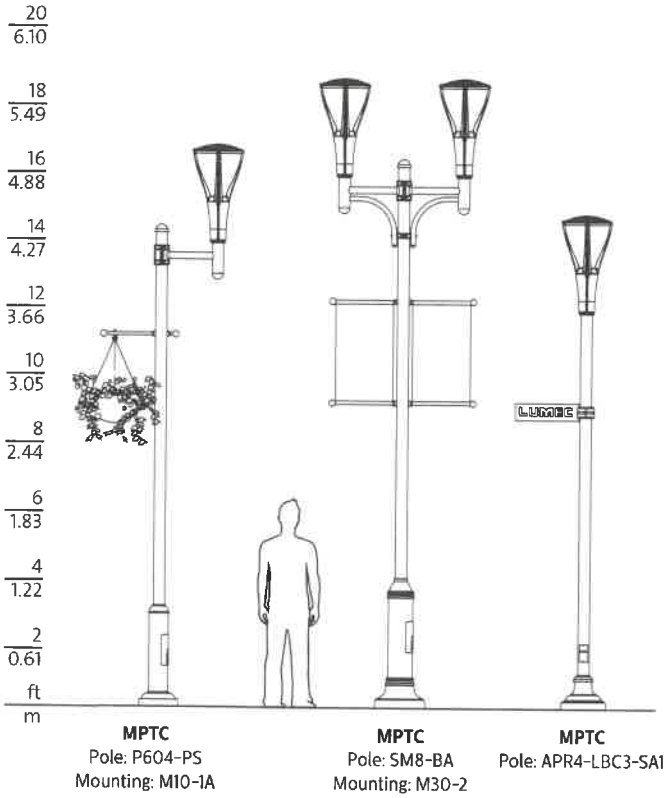
1. Predicted performance derived from LED manufacturer's data and engineering design estimates, based on IESNA LM-80 methodology. Actual experience may vary due to field application conditions.
2. L_{70} is the predicted time when LED performance depreciates to 70% of initial lumen output.
3. Calculated per IESNA TM21-11. Published L_{70} hours limited to 6 times actual LED test hours.

MPTC UrbanScape LED Post Top

Urban Luminaire

Specifications (continued)

Poles



MPTC
Pole: P604-PS
Mounting: M10-1A

MPTC
Pole: SM8-BA
Mounting: M30-2

MPTC
Pole: APR4-LBC3-SA1

Consult Signify.com/outdoorluminaires for details and the complete line of Signify poles and brackets.

Signify

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Signify North America Corporation
200 Franklin Square Drive
Somerset, NJ 08873
Telephone 855-486-2216

Signify Canada Ltd.
281 Hillmount Road,
Markham, ON Canada L6C 2S3
Telephone 800-668-9008

www.lumec.com

SECTION #14

Natural Character/Topography

Item #14

Whether the Proposed Project Leads to a Major Change in the Natural Character of the Area Through the Removal of Natural Vegetation.

The Initial answer is that the natural character of the subject property will not be changed through the removal of natural vegetation.

The subject property is an abandoned quarry with very little, if any, organic matter to support plant life. Over 90% of the surface area is exposed bedrock and does not support plant life. There are several small areas where Cedar, White Birch, and other hearty vegetation has grown. There are a few areas where vegetation has grown to the extent that, if possible, these areas will be left in a natural state.

On a side note, since there is little, if any native vegetation, there is little concern by the county to protect habitat for native plants and animals on the subject property. In reviewing the "Door County Greenprint Goal" of **Protecting Habitat for Native Plants and Animals** priority areas are designated by highlighting various areas of the county. (Please see attached.) While undisturbed escarpment areas of the county are of high concern, the subject property, being an abandoned quarry, ranks on the lowest end of the protection spectrum. (See Enlarged Map.)

The overall landscaping of the development will be spearheaded by a professional landscape architect, well versed in preserving the natural integrity of the Niagara Escarpment. The existing natural beauty of the rock walls and rock outcroppings will be enhanced with sustainable, ecologically based landscaping. There will be approx. eight acres of common area that will be low impact, focusing on native grasses, wildflowers, and other native vegetation requiring minimal maintenance. Pesticides and fertilizers will be kept to a minimum.

There will be some areas that will require more intense landscaping. Screening for privacy reasons will be required. There will be strict guidelines that will have to be met following county zoning regulations for perimeter property screening.

Upon completion of the project 68% of the entire development will be landscaped with plant materials or water features. Again, with the guidance of an experienced landscape architect the intent will be to create a balanced landscape environment that appeals to owners, visitors, and the general public.

Conservation Map Goals

A set of targeted land use management and planning goals, specific to Door County were identified by local and regional advisors. Each goal has been characterized using best available data, scientific review, and advanced analysis. The maps, reports, and interactive tools on this website will enable you to identify and explore locations of highest concern for each goal.

1. **Protect Habitat for Native Plants and Animals**
2. Restore Landscape Connectivity
3. Protect Surface Water Quality
4. Protect Ground Water Quality

How the Goal Map "Protect Habitat for Native Plants and Animals" was Created

Each goal map is a composite of a number data layers known as "metrics" or "criteria". The criteria data layers were created in consultation with the Door County Greenprint Technical Advisory Team comprised of resource experts and water scientists from Door County and across the region. For detailed information on data and methodology used to create the criteria layers, refer to last three pages of this document.

The composite map for each goal was created by combining the criteria data layers using a "weighted overlay" process. The Technical Advisory Team was responsible for determining a relative weight for each criterion layer, based on their knowledge of the subject areas and the datasets. The rationale that was used for assigning a higher or lower weight to a specific criterion included:

- Importance of that criterion for meeting the goal
- Quality or currency of the data used in the model
- Comprehensiveness of the data or modeling process

The following table summarizes the criteria layers considered for the goal and the relative weights used in the overlay process to create the composite goal map.

Goal	Criteria	Weight
Protect Habitat for Native Plants and Animals		
	Large, Unfragmented Natural Areas	11%
	Habitat Richness	11%
	Escarpment	9%
	Embayment Complexes	9%
	Riparian Habitat	9%
	Migratory Bird Stopover Habitat	9%
	Coastal Wetlands	9%
	Coastal Habitats and Undeveloped On-Shore	9%
	Natural Communities and Habitats	8%
	Rare Species	4%
	Bedrock Beaches	4%
	Undeveloped Off-Shore	4%
	Conservation Opportunity Areas	4%
	TOTAL	**100%**

Rationale:

• The two criteria analyzing natural blocks (Large Unfragmented Natural Areas and Habitat Richness) were given highest weight to emphasize the importance of size and diversity in currently undisturbed blocks of natural land.

• High importance was also assigned to criteria that characterize "Sensitive" features across the landscape, including the escarpment, embayment complexes, riparian habitat, migratory bird habitat, coastal wetlands, and other coastal habitats.

• Natural Communities and Habitats was assigned moderate weight, because of the more generalized nature of the model results.

• Rare Species. Bedrock Beaches, and Undeveloped Offshore were all assigned less weight due to lower confidence in available data and/or modeling results. For example:

- *There is high variability in the resolution at which rare species are recorded in Natural Heritage Inventory dataset.*
- *There were modeling limitations on representing exact width of bedrock beaches.*

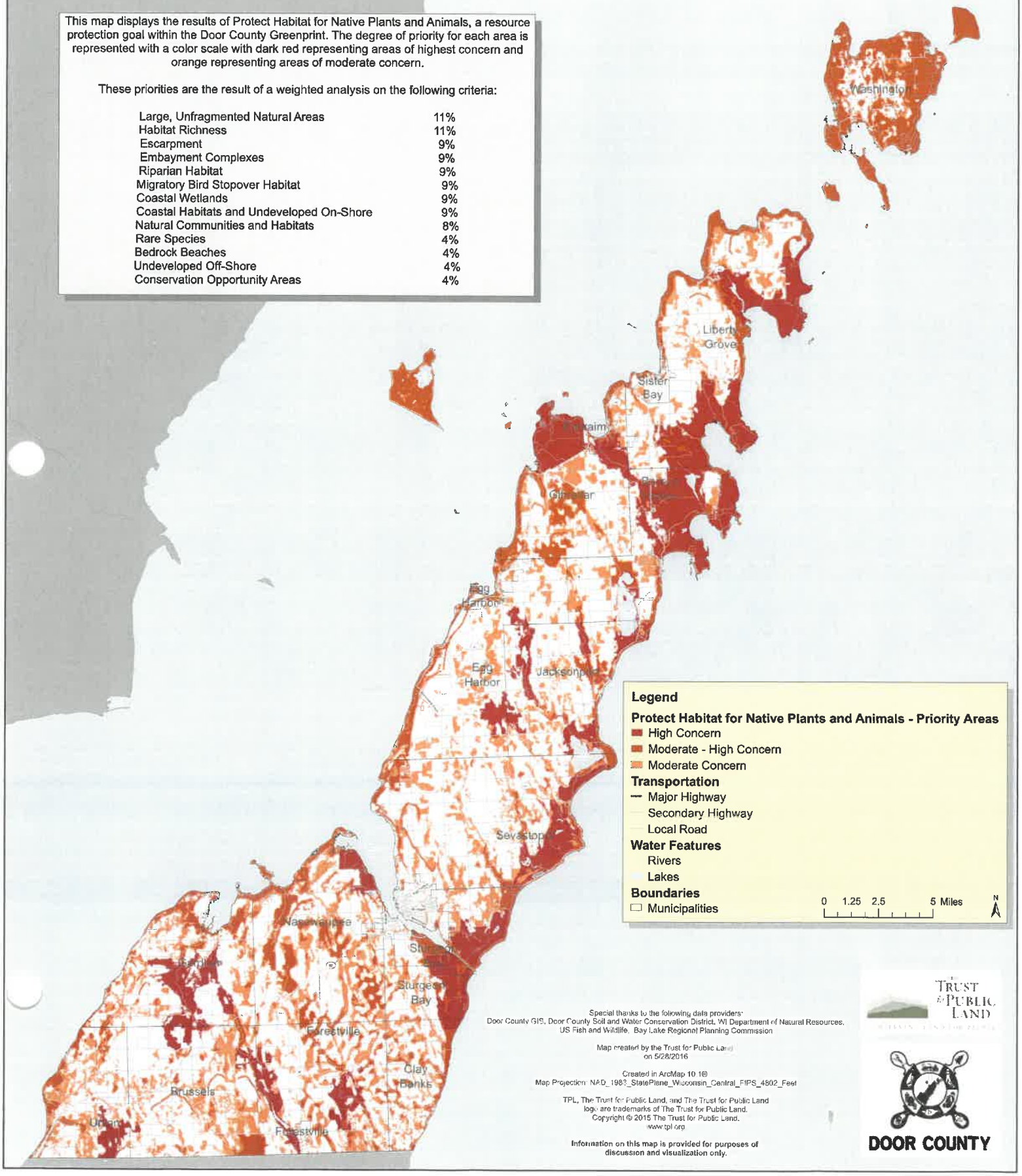
• Conservation Opportunity Areas was also assigned lower weight because of its generalized nature. However, it does incorporate additional analysis not captured in other criteria (breeding bird surveys, tied to wildlife action plan, other specific DNR studies and expertise)

Door County Greenprint Goal: Protect Habitat for Native Plants and Animals

This map displays the results of Protect Habitat for Native Plants and Animals, a resource protection goal within the Door County Greenprint. The degree of priority for each area is represented with a color scale with dark red representing areas of highest concern and orange representing areas of moderate concern.

These priorities are the result of a weighted analysis on the following criteria:

Large, Unfragmented Natural Areas	11%
Habitat Richness	11%
Escarpment	9%
Embayment Complexes	9%
Riparian Habitat	9%
Migratory Bird Stopover Habitat	9%
Coastal Wetlands	9%
Coastal Habitats and Undeveloped On-Shore	9%
Natural Communities and Habitats	8%
Rare Species	4%
Bedrock Beaches	4%
Undeveloped Off-Shore	4%
Conservation Opportunity Areas	4%



Special thanks to the following data providers:
Door County GIS, Door County Soil and Water Conservation District, WI Department of Natural Resources, US Fish and Wildlife, Bay Lake Regional Planning Commission

Map created by the Trust for Public Land on 5/28/2016

Created in ArcMap 10.1®
Map Projection: NAD_1983_StatePlane_Wisconsin_Central_FIPS_4802_Feet

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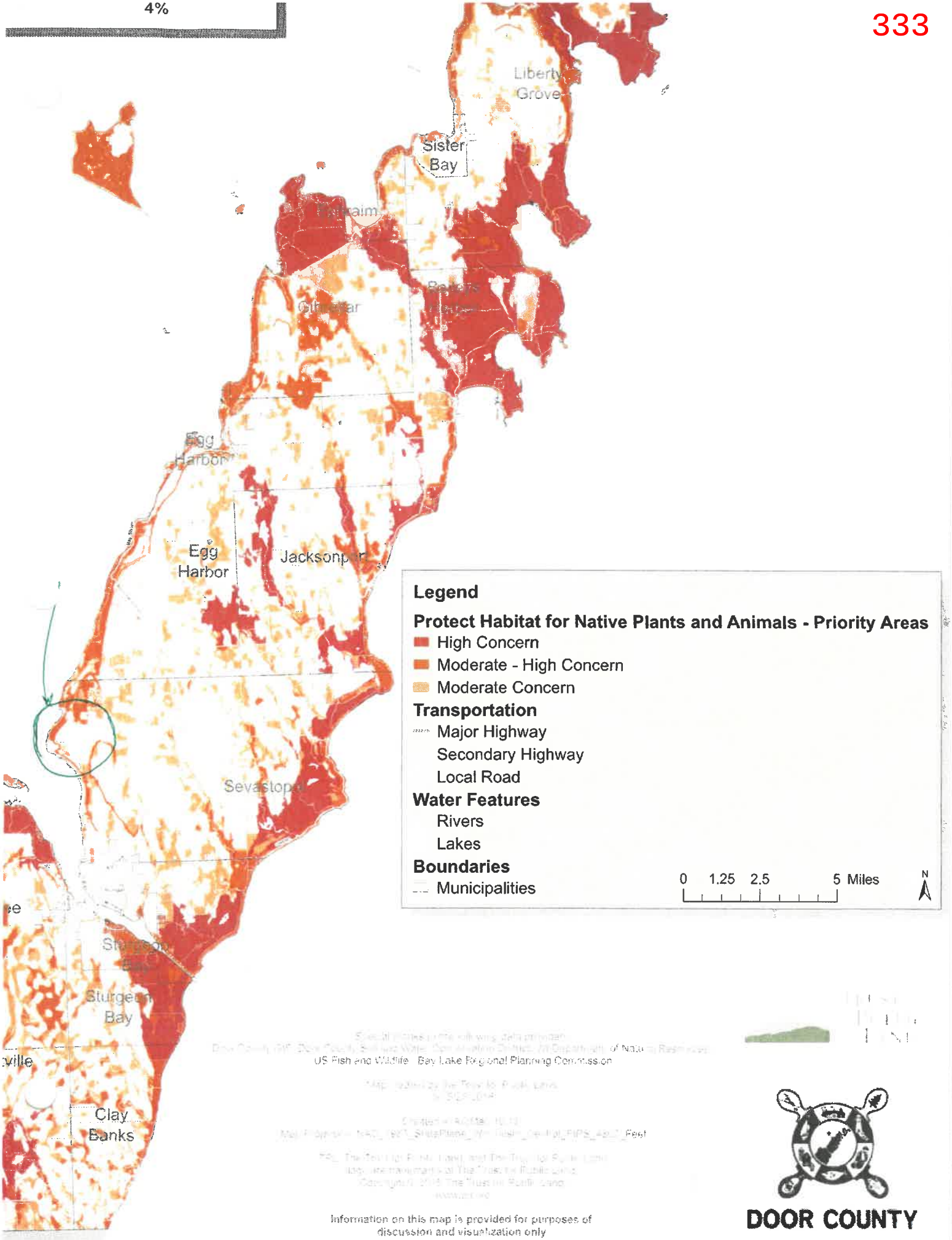
Information on this map is provided for purposes of discussion and visualization only.

THE TRUST FOR PUBLIC LAND

DOOR COUNTY

4%



US Fish and Wildlife · Bay Lake Regional Planning Commission

Information on this map is provided for purposes of discussion and visualization only

DOOR COUNTY

Door County Greenprint Model

Model Criteria
March 11, 2015

Goal	Criteria	Methodology	Data	Data Sources	Data Confidence (High, Med, Low)
Protect Habitat for Native Plants and Animals					
	Rare Species	This model assigns priority to areas with rare species based on Natural Heritage Inventory data provided by Wisconsin Department of Natural Resources. The model ranks the data on a scale of 0-5, as follows: Federally listed species and dragonfly critical habitat =5 (highest concern State Threatened/Endangered (but not Federal Threatened/Endangered) = 4 Species of State Special Concern = 3 Dragonfly Potential Habitat = 3. Important potential habitat data identified by TNC = 2 All Developed Land cover types were removed from the ranked results. Note: Non-listed SGCN are not included (spatial data was not available).	Designated critical habitat for Hine's Emerald Dragonfly Potential Hines Emerald Dragonfly habitat Natural Heritage Inventory Important potential Habitat Landcover 2008	Designated critical habitat for Hine's Emerald Dragonfly (Door County Soil & Water Dept) Groundwater areas for Hine's Emerald Dragonfly (Door County Soil & Water Dept or TNC) Wisconsin Department of Natural Resources The Nature Conservancy Door County	Low
	Natural Communities and Habitats	This model uses Door County 2008 landcover to identify natural communities and habitat. The following landcover types were taken into consideration, and were ranked on a scale of 0-5 as follows: **High Concern (5) -** Beaches, Bluffs, Natural Areas, Nature Study Areas, Other Natural Areas, Other Publicly-Owned Natural Areas, Parks/Parkways/Forest-Related Picnic Areas, Wildlife Refuges, Wetlands, and Woodlands greater than 30 acres. **Moderate Concern (3) -** Other Natural Areas including Wetlands and Other Publicly-Owned Natural Areas (determined via imagery that these types were more disturbed). **Low Concern (1) -** Commercial Forests, Tree Plantations, Open Space, and Grasslands. Developed typeare not a priority Model updated March 2014 due to new zoning data.	Significant Wildlife Habitat Door County Zoning (wetlands areas, most of study area) Wisconsin Wetland Inventory (where zoning does not have data) Landcover 2008	Door County Door County Door County Door County	High
	Escarpment	This model assigns high concern to escarpment areas. Available escarpment location data was line data. A 200 foot buffer was created around each line.	Escarpment	Bay-Lake RPC	Medium

Door County Greenprint Model

Model Criteria

March 11, 2015

Goal	Criteria	Methodology	Data	Data Sources	Data Confidence (High, Med, Low)
	Embayment Complexes	This model ranks embayment complexes. Embayment complexes were dervied as specified in 2009 mapping exercise by Door County and The Nature Conservancy. In this modeling effort, areas with sand deposits were identified using soils data, and then scored using the following approach: Presence of surface water (0 points =no water, 3 points =water present) Percent development (1-5 points based on percentage) Development along shore (1-5 points based development intensity), Total area (1-3 points based on relative overall size), Diversity of NHI Occurences (0 points = no rare species, 3-5 points based on relative diversity of site), Number of NHI Occurrences (0-2 points based on rare species count). Diversity of non disturbed habitat (0 points for distubed habitat, 3-5 points based on relative diversity of site). Scores were added together, and then normalized to be consistent with Greenprint scoring range of 0-5 Model not rerun in March 2011 even though new hydro data and impervious data are available. The new streams data would make no change in the result of this model as points are given simply for presence of surface water. The impervious is not needed as the percent development aspect of this model is derived from the landcover data. Not impervious.	Embayment Complexes Streams Door County Boundary 2008 County Landcover Natural Heritage Species Locations	Door County and TNC Door County GIS Door County GIS Door County GIS Wisconsin Department of Natural Resources WI DNR Landcover Dataset with Forest Types	Medium
	Coastal Wetlands	This model assigns highest concern (5) to all wetlands within 50 feet of shoreline. Moderately high concern (4) was assigned to any wetlands that were within 25 feet from the high priority wetlands above. Model updated March 2014 due to new zoning.	Shoreline Door County Zoning (wetlands areas) Cities where zoning data does not have wetland information Wisconsin Wetland Inventory	Door County Door County TPL Wisconsin Department of Natural Resources	High
	Bedrock Beaches	This model identifies Gravel Beaches from the Environmental Sensitivity Index Shoreline data. Available data used was line format The line was buffered to the high water mark of 584 ft.	NOAA environmental sensitivity 2 ft contours Shoreline	USF&W Door County Door County	Low
	Riparian Habitat	This model identifies streams designated as trout streams and/or as outstanding and exceptional waters by the Wisconsin DNR Fisheries Program. A 200 ft buffer was created along all identifed streams. Streams were ranked as follows: Critical habitat waters, trout streams, and designated outstanding waters = 5 (highest concern) Designated exceptional waters (may have point source influences) = 4 Other stream segments = 3	Wisconsin Trout Streams layer Outstanding and Exceptional Streams Door County Critical Habitat Designations	DNR Fisheries Program designated waters Wisconsin Department of Natural Resources Wisconsin Department of Natural Resources	Low
	Migratory Bird Stopover Habitat	This model identifies migratory bird habitat along shorelines. Areas are ranked using shorebird, waterbird and landbird priority scores provided by Wisconsin DNR. DNR scoring is based on proximity to shore, covertype, and patch size.	Shorebird, waterbird and landbird data	Wisconsin Department of Natural Resources	High
	Undeveloped Off-Shore	The model assigns priority to shoreline with no off-shore man-made structures. Piers and docks were located by reviewing high resolution 2007 imagery. After removing all segments with man made structures from the shoreline data, the remaining undeveloped shoreline was buffered by 200 feet (or the average lot width). Undeveloped Shoreline that has sandy beaches was ranked as a 5 (highest concern) other shoreline types were scored as 4.	Pier, boat ramp and seawall locations 2008 County Landcover Streams and Rivers Environmentally Sensitive Shoreline Inventory	TPL digitized from 2007 Pictometry Door County GIS Door County GIS USF&W	Medium

Door County Greenprint Model

Model Criteria
March 11, 2015

Goal	Criteria	Methodology	Data	Data Sources	Data Confidence (High, Med, Low)
	Coastal Habitats and Undeveloped On Shore	This model identifies and ranks coastal habitats by incorporating Natural Heritage Inventory sites within 1/2 mile of the shoreline and all woodlands within 1/4 mile of the shoreline. Areas are ranked based on degree of disturbance to the natural landcover: Natural Landcovers = 5 (highest concern) Moderately Disturbed Areas = 3 Disturbed Areas = 1 Developed Landcover not a priority Model updated Sept 2012 due to new zoning.	Natural Heritage Inventory Shoreline from Hydrology Woodlands from Landcover 2008 Hines Dragonfly contributing habitat Hines Dragonfly critical habitat 2008 County Landcover Roads Rivers and Streams	Wisconsin Department of Natural Resources Door County Door County GIS Wisconsin Department of Natural Resources Wisconsin Department of Natural Resources Door County GIS Door County GIS Door County GIS	High
	Large, Unfragmented Natural Areas	This model uses Door County 2008 landcover to identify natural areas. The following landcover types were considered "natural": Beaches, Bluffs, Natural Area, Nature Study Areas, Other Natural Area, Wetlands, other Publicly-Owned Natural Areas, Parks/Parkways/Forest-Related, Parks/Parkways/Forest-Related Picnic Area, Wildlife Refuges, and Woodlands. Also included are Wetlands from Door County Zoning/Wisconsin Wetland Inventory. Fragmentation of these natural blocks was modeled by removing buffered paved roads. Remaining contiguous blocks were then ranked by size: Unfragmented blocks of 1000 or more acres were ranked as 5 (highest concern). Blocks 500-1000 acres were ranked as 4. Blocks 150-500 acres ranked as 3. Blocks under 150 acres were not considered "large", and therefore were not included. Model updated March 2014 with new zoning and roads data.	Door County Zoning (wetlands areas) Cities where zoning data does not have wetland Information Wisconsin Wetland Inventory Landcover 2008 Roads Impervious Surface	Door County TPL Wisconsin Department of Natural Resources Door County Door County Door County	High
	Habitat Richness	This model prioritizes unfragmented natural areas based on a "habitat richness" score. Unfragmented blocks of at least 150 acres in size were determined using the methodology described above. Blocks were then assigned points based on the following strategy: Number of NHI species occurances (1-5 points based on occurance count). Number of different landcover types (1-5 points based on landcover type count) Presence of a natural spring (3 points) Presence of surface water/ outstanding/exception waters / trout waters (2-5 points based on types present) Presence of escarpment areas (2 points) Access to shoreline (3 points) Overall size (1-5 points based on size range). Scores were added together, and then normalized to be consistent with Greenprint scoring range of 0-5 Model updated March 2014 with new roads and zoning data.	Door County Zoning (wetlands areas) Cities where zoning data does not have wetland Information Wisconsin Wetland Inventory 2008 County Landcover Roads Natural Heritage Inventory WDNR Landcover data with forest types Springs Streams and Rivers Outstanding and Exceptional Streams Trout Streams Escarpmet Impervious Surface	Door County TPL Wisconsin Department of Natural Resources Door County Door County Wisconsin Department of Natural Resources Wisconsin Department of Natural Resources Door County GIS Door County GIS Wisconsin Department of Natural Resources Wisconsin Department of Natural Resources Door County GIS Door County GIS	High
	Conservation Opportunity Areas	This model identifies areas designated as Wisconsin DNR Conservation Opportunities Areas (incorporates WI Wildlife Action Plan priorities).	Conservation Opportunity Areas	Wisconsin Department of Natural Resources	High

Item #14

Whether the Proposed Project Leads to a Major Change in the Natural Character of the Area Through the Alteration of the Topography

The project site is an abandoned quarry. Quarrying operations were discontinued prior to 2001. Therefore, the state of Wisconsin's NR135 nonmetallic mine reclamation requirements do not apply to this site. Reclaiming means providing topsoil replacement, re-vegetation, and the control of storm water runoff among other things. The proposed development will provide these items.

The topography of the vertical walls and major rock outcroppings will not be changed. Grading and changes in the topography will take place on the floor of the quarry and driveway entrances.

The site will be improved by filling and grading to direct surface runoff to designated storm water ponds for treatment. Ironically, there is a natural surface slope of the quarry floor of approx. one-half percent extending from north to south. This slope will help minimize the amount of filling and grading to achieve control of stormwater runoff. Change in actual finish grade from existing grade, will on average, be less than 2ft.

Access driveways will need to be excavated and graded to create acceptable road slopes. The existing slopes are near code compliant, but there will be necessary excavating/grading work to construct the driveways.

Green space areas will receive clean fill and topsoil providing additional filtering qualities that are currently not in place. This project, by default, will meet the intent of a formal reclamation plan.

Additional information is provided near the end of the CUP regarding construction concerns.

OVERVIEW OF THE NONMETALLIC MINING RECLAMATION PROGRAM

In response to concerns about abandoned nonmetallic mining sites, Wisconsin Act 464 was enacted in April of 1994. Through this law, the Legislature directed the WDNR to write a reclamation rule that could be used to implement uniform statewide mine reclamation standards. After several revisions and public comment, Chapter NR 135 Wis. Adm. Code was published in September of 2000 and became effective in December 2000. The purpose of NR 135 is to establish county and municipal reclamation programs through the enactment of an applicable ordinance as a means of ensuring that uniform reclamation standards are applied consistently throughout the state. In this way, NR 135 provides assurance that a stable and productive post-mining condition will be achieved at all active nonmetallic mines in the State of Wisconsin. This new rule made it mandatory for counties to enact ordinances by June 1, 2001 for the purpose of establishing and administering programs to address the reclamation of nonmetallic mining sites. Although mandatory for counties, the rule allows the option of enacting an ordinance establishing a reclamation program for cities, villages and towns.

It is important to note that reclamation is a separate program and is in addition to all existing and applicable federal, state, county and local requirements. In writing the reclamation law, the legislature conveyed its intent that land use decisions continue to be addressed within the existing county or local zoning process. **The requirements contained in NR 135 serve only to create a uniform standard of reclaiming nonmetallic mining sites.** Thus, NR 135 confines itself to the implementation of the reclamation standards while the regulation of mine operations and the actual siting of nonmetallic mines continues to be a local decision.

BY GARY M. PIERZYNSKI
JUN 03, 2015
FACEBOOKTWITTERLINKEDIN

SOIL: EARTH'S LARGEST NATURAL FILTER

Soil's benefits as a filter for a variety of contaminants

Water that enters the soil and flows downward likely will be used again by society. The most common scenario would be that the downward-flowing water recharges the groundwater reserves that are then used as a source of drinking water or for irrigation. Groundwater also often has a hydrologic connection with surface water bodies, so the characteristics of the groundwater can influence aquatic habitats in a lake or river, which then may be used as a source of drinking or irrigation water. Fortunately, soils are great water purifiers—in fact, they represent the largest natural filter on the planet. These filtration benefits are an important part of the ecosystem services provided by soil.

Water Sources

When we think of water entering the soil and flowing downward, we typically imagine rainwater or perhaps irrigation water of reasonable quality. Those water sources, while they may need a bit of purification, generally are fairly clean and could be used by society without much additional treatment.

Consider the numerous scenarios, however, in which lower-quality water enters the soil and needs to be purified before being used again by society. Greywater, which is wastewater from residential dwellings except that from the toilets (that wastewater is called blackwater), is a good example of

water that can be applied to soil without further treatment. An industrial equivalent to greywater would be water used in food processing, such as washing fruits and vegetables or the manufacture of cheese and other dairy products.

Effluent from wastewater treatment plants often is land-applied in an effort to recycle plant nutrients and minimize less sustainable disposal options. Similarly, water from retention ponds capturing runoff from livestock facilities often is land-applied, as is the manure. Septic systems that treat both greywater and blackwater from a home also utilize the ability of soil to filter water.

Surface water runoff occurs when the rate at which water is falling on a surface exceeds the rate at which that surface can absorb water. The excess water that becomes surface runoff moves downslope, and the composition is impacted by the surface itself. That surface might be soil or an impervious material like pavement or roofing. If the surface runoff goes directly to surface water, it does not benefit from interaction with soil; however, surface runoff often eventually does enter the soil downslope of where it originated, in retention ponds or rain gardens.

Filtration Methods

Water entering the soil may have a variety of constituents that require removal prior to reuse by society or to minimize negative environmental impact. Those constituents might include sediment, pesticides, plant nutrients, salts, bacteria, viruses, heavy metals, organic chemicals (including petroleum products), pharmaceuticals and personal care products. Considering the sources of the water that is entering the soil, it is easy to see how one or more of these constituents could be present. Soil can provide much of the filtration that is needed, either as part of the ubiquitous ecosystem services it provides or by design.

The ability of soil to provide this filtration is through one or more physical, chemical or biological processes that remove or degrade various constituents in water as it passes through on its way to groundwater. Physical filtration is directly analogous to passing water through a screen: The soil acts as a sieve and holds back particles that are too large to pass through. Unlike a simple screen, however, this characteristic is enhanced by the tortuous path that water takes through the soil, which provides multiple opportunities to capture constituents. Sediment and even bacteria can be removed by this mechanism.

The surfaces of soil particles often are chemically reactive and provide multiple means by which contaminants in water can be adsorbed by soil particles and effectively be removed from the water

by chemical processes. Many soil clay particles have a negative charge and will attract any constituents in the water that have a positive charge (e.g., some heavy metals, salts, organic chemicals and pesticides). Another mechanism is the formation of covalent bonds (sharing of electrons) that helps soil retain many organic chemicals, pesticides and some inorganic constituents.

Soil is teeming with life—particularly a wide variety of microorganisms that have the ability to degrade or transform both organic and inorganic substances in the soil environment. This is particularly useful when water contains organic materials that have a high biological oxygen demand and would impart negative effects on water if they did not undergo further decomposition first. This would apply to effluent from wastewater treatment plants, food processing waste and water from livestock facilities. In addition, soil microorganisms can often specifically degrade organic chemicals that would be considered contaminants if present in drinking water.

Filtration Limitations

Of course, like a filter designed and built by engineers, the ability of soil to purify water has limitations that must be recognized and taken into account. It is no coincidence that nitrates, a form of nitrogen that acts as a plant nutrient, and trichloroethylene, an organic solvent, are two contaminants that often are reported to be in groundwater if one considers the characteristics of those substances. Both are soluble in water and neither can be chemically adsorbed by soil or degraded or transformed by soil microorganisms. As a result, both essentially move with soil water and frequently end up in groundwater.

Sandy soil allows water to move quickly through and has limited ability to chemically adsorb constituents in water, thus limiting opportunities for filtration. Groundwater quality issues are more common in areas with sandy soil and where the groundwater is close to the soil surface. Any soil has a finite capacity to purify water, and excessive applications of water or other materials requiring purification to the soil can result in limited treatment.

Soils are great water purifiers, and both society and the environment benefit from them, whether from the ecosystem services they provide that protect freshwater resources, or from their deliberate use as a filter, which allows us to effectively remove a variety of byproducts with relative ease. For further information and resources on the abilities of soil to clean and capture water, visit www.soils.org/iys/12-month-resources/april.

SECTION #15

Financial Assurance

Item #15

Whether, and in What Amount and Form, Financial Assurance is Necessary to Meet the Objectives of this Ordinance

Like all ordinances, the conditional-use code was put in place to help protect the safety and well-being of the public. As they pertain to our project and others, the rules seek to ensure that items such as safety and quality of drinking water is protected, storm runoff will be controlled, waste water is handled properly, trash and recycling is managed, and codes are followed.

Additionally, depending on the nature of the development, sometimes municipalities will require financial assurances in cases where there may be a large central building that gets built with anticipated presales being crucial to the buildings and grounds being completed properly. If sufficient sales do not materialize, partially completed structures and grounds with no maintenance can be a blight on the neighborhood. This development is an entirely different situation because all of the heavy work/construction/infrastructure must be in place before the first parcel can be sold. Therefore, the completion of our major work is not dependent on sales.

Early in the beginning of the development, the wells and water system, the wastewater collection/holding system, and the stormwater runoff and containment site work will all be in place. The lion's share of the engineering for these items has already been completed so we could pursue permitting. Most of the money needed to meet the objectives of the ordinance has already been spent or will be spent early on. Because of all of the above, financial assurances i.e. bonding, letters of credit, etc. would be moot in this particular situation. The worst case scenario is that Door County would end up with a beautifully reclaimed surface mine.

SECTION #16

Impacts

SAFETY WALL & RAILING THEME

Item #16

Whether, and to What Extent, Site-Specific Conditions Should be Imposed to Mitigate Potentially Problematic Impacts of the Use.

Site-specific conditions have been addressed under each of the various conditional use permit addendums. There are several site-specific conditions not previously addressed that we feel should be imposed to mitigate potential problematic impacts;

- Safety barriers and/or walls will be installed as necessary at various locations where unsafe conditions exist.

- Pond construction will be performed meeting all safety standards regarding safety ledge water depth, including industry standard horizontal and vertical distances.

- Use of pesticides and fertilizers to be kept at a minimum. Organic fertilizers and other natural applications to be used wherever possible.

- Graffiti and other unattractive painting will be cleaned from any rock surfaces returning surfaces to a more natural state.

- Operational rules and regulations governing the day to day operations of the development to be implemented and enforced by onsite management. The intent is to provide a life style experience that is wholesome, positive, and pleasing. Please see attached rules and regulations that will be implemented. There will be additional site-specific rules implemented that only pertain to the quarry development.

Quarry Bluff Development LLC Bylaws and Rules

The following is a partial list of items that will be found in our Bylaws/Rules and Regulations.

1. The Unit Owner must obtain all necessary approvals and permits from applicable government entities for construction of any structure not on unit at time of purchase.
2. The Board retains the authority to approve, disapprove or require modifications to the proposed work.
3. No Unit Owner may make any alterations, add to, or remove any exterior portion of the unit that needs a permit without the prior written approval of the Board of Directors. Normal repairs and maintenance do not require Board approval.
4. The Unit Owner must submit a property modification providing the following information. The type, shape, dimensions, materials, color and location of changes made to the exterior of the Unit.
5. The entire expense must be borne by the Unit Owner, including any subsequent maintenance and restoration.
6. No Unit Owner will do any work that would jeopardize the safety or soundness of any buildings, units or impair any easements. Owner will be financially responsible for any resulting damage to persons or property.
7. County building permits must be obtained, and a copy provided to the association before any construction can commence.
8. The power source for all units will be heat/hot water by natural gas. Backup generators can be used during power outages only. No propane canisters larger than 20lbs are permitted and are for outdoor use only.
9. No clothes lines. Collapsible umbrella type allowed with Board approval. A property modification form is necessary.
10. A variance for all the above architectural requirements must be approved by the Board of Directors.
11. Quarry Bluff is a Residential Condominium Complex. All unit owners, guests and tenants shall refrain from creating noise or other disturbances offensive to neighbors at all times.
12. Refrain from hanging swimsuits, towels or other clothing from deck railings, etc.
13. Renting a unit at Quarry Bluff does not include the right to use it as a gathering point for friends and relatives staying elsewhere in the area.
14. No parking on roads at any time. Additional parking is available in overflow areas.
15. Boats and trailers must be parked by the garage/storage area. They must not be parked in driveways or by the clubhouse area.
16. Vehicles parked in unauthorized areas are subject to being towed away at the owner's expense.
17. Do not leave garage doors open when not in use.
18. Owners and their guests need to do the following:
    a. Clean up after pets.
    b. All pets shall be kept on a leash and accompanied by its owner at all times when outside the unit.

c. If you have a dog who barks when left home alone, please deal with the issue by taking the dog to a kennel. Homeowners should not have to hear a dog barking for hours during the day/night.

19. All glass containers are prohibited in the pool area.
20. Quarry Bluff recycles aluminum, plastic, glass, paper and cardboard. Cardboard boxes must be broken down before placing in the recycle bin.
21. All refuse shall be discarded in plastic bags and placed in centrally located trash containers provided by the Association and located in the trash building next to the clubhouse parking lot.
22. The speed limit on all roadways is 10 miles per hour. Please observe this speed limit for the safety of our children and others using the roads for walking and biking.
23. Swimming is not allowed in the ponds, including pets.
24. Do not throw rocks into the ponds. Do not disturb the pond shoreline nor the flowage between the upper and lower ponds. Do not fish in the ponds.
25. The ponds have liners and if they are damaged the cost of replacing them is very high.
26. Fire pits must be gas log only and must be approved by board and installed by Developer's contractor.
27. All rentals shall be processed and approved by the association. No direct rentals by owner, including on-line rental services, will be allowed.
28. No more than six people may occupy a two-bedroom unit and no more than 8 people may occupy a three-bedroom unit when it is being rented.
29. Renters are not allowed to have pets in any unit or on association property.
30. Renters are not allowed to smoke in any unit.
31. Renters are allowed to park a maximum of two passenger vehicles at or near the unit.
32. For security purposes, all persons using or visiting a unit, whether the owner or their family, guests and/or renters, must register with the Association upon or prior to arrival and must provide the name, address, vehicle description, and such other information as the Association deems necessary from time to time for the benefit, safety and welfare of the community.
33. Only self-contained, Class "A" motorcoaches at least 35 feet in length and less than 10 years old shall be permitted for use in the community. All motorcoaches must be modern, commercially manufactured, RVIA (the Recreational Vehicle Industry Association) approved recreational vehicles and maintained in the "Pride of Ownership" condition. The determination of what constitutes "Pride of Ownership" condition shall be made by the Association from time to time in its sole discretion.
34. A motorcoach which is less than 35 feet in length or older than ten years (such as a restored classic in good condition) may be approved at the discretion of the Association. The Association shall consider the physical appearance of the motorcoach, and the Association's decision shall be final.
35. No travel trailers, 5th wheels, park models, mobile homes, tents, truck campers, Class "B", or Class "C" motorhomes, fold out or pop-up campers, non-commercial conversions of trucks, buses and vans, nor any other types of recreational vehicles not equipped for full utility hookups to water, sewer and electrical systems are permitted.
36. Any "slideout" must be mechanically operable at all times and be capable of use independent of any bracing from the ground or otherwise.
37. A motorcoach air-conditioning unit must be a factory installed component integral to the Motorcoach itself. An air-conditioning unit for the home may be a ground unit provided that it is located on a solid concrete pad, out of public view (or, if it cannot be located out of public view,

is screened by plantings) and is approved by the association. Window and through-wall air-conditioning units are not permitted.

38. Permanent awnings, solid patio awnings, screen rooms, carports and patio rooms are not permitted.
39. Roll-up awnings are permitted provided that they are rolled up when the motorcoach is left unoccupied for longer than 48 hours.
40. Items of personal property typically intended for outdoor use, such as a grill, table and chairs, etc. are permitted outdoors. Such personal property may remain on the unit year around, but, as far as reasonably practical, should not be left out so that it can be seen form the street or from another unit when the unit is not in use. Owners shall take care that all items left outdoors are left in a neat and orderly fashion when the unit is in use. No plastic tarps or covers will be allowed except during an approved construction project.
41. No outside satellite receptor dishes or devices, television or radio antennas, or any other type of electronic device for the transmission or reception of electronic signals shall be permitted without the prior written approval of the Association, except those commercially manufactured and installed as part of the motorhome which are not free-standing off the ground.
42. The display of any flag, on any unit, shall meet the following criteria or be approved in writing by the Association. No flag may be erected on any common area in the development, except by the Association. Up to two flags no larger than 3' x 5' are permitted and shall be attached to the motorcoach, unit, or home and not affixed to the ground. The height of any flag shall not exceed 12 feet above the ground.
43. Landscape and exterior lighting must be placed in planters or mounted on hardscapes to facilitate mowing. Any lighting placed on a lawn area must have a hardscape border around all of the lights. No outdoor property night lights of any kind shall be permitted to cast its direct rays beyond any of the boundary lines of the unit in which it is installed or maintained. Timed or automatic lighting devices are permitted provided that they are properly shielded. All exterior lighting must be approved by the Association. And be consistent with Dark Sky Practices.
44. Cosmetic and garden walls are permitted with prior approval from the Association. Concrete, masonry, brick, stone, and wood are the only approved materials. No vinyl or plastic will be permitted. Walls should be intended to enhance the unit and may not be used for privacy or sectioning off a unit.
45. Any landscaping (especially trees) shall be reviewed and approved at the discretion of the Association in terms of its overall visual impact on neighboring units as well as the development as a whole. Landscaping, lawns and trees shall also be subject to these further specifications, standards and restrictions.
46. Lawns will be maintained by the Association.
47. In the event an owner fails to maintain the landscaping on their unit as required, the Association shall have the authority to remedy the problem and bill the owner.
48. No unlawful or offensive activity shall be carried on in any unit or in the Common Areas nor shall anything be done which may be or become an annoyance or a nuisance to the owners of the units. No unreasonably noisy activity shall occur in or on the Common Areas or in any unit at any time, and the disputes among owners arising as a result of this provision which cannot be amicably resolved, shall be arbitrated by the Association.
49. The discharge of any firearm, bow and arrow, slingshot, air gun, or any type of weapon that shoots any type of projectile with force is prohibited within the development. Fireworks, sparklers, burnpiles and open fires are prohibited.

50. No maintenance, other than minor maintenance, of automobiles, motorhomes, or recreation equipment is permitted in the community. Minor maintenance activities are defined as any activities which are completed within one day and the vehicle or equipment being maintained must be restored to its assembled condition at the conclusion of the activity.
51. No equipment or device of any nature which would emit sounds to a unit or Common Area or to its occupants shall be permitted in use before 8:00 AM or after 8:00 PM. Quiet time at 10PM will be strictly enforced. Such equipment includes, among other things, electric or power blowers, trimmers, saws or any other power tool or device emitting a loud or annoying noise. No noise is permitted to exist or operate upon any unit or Common Area which would be offensive or detrimental to any other property or to its occupants. Without limiting the generality of the above, excessively noisy vehicles of any kind, exterior speakers, horns, whistles, bells, chimes, or other sound devices or loud voices are prohibited. Noise generated from TVs, radios, musical instruments, etc., must be minimized in consideration of neighboring owners.
52. The Association shall contract for and regulate garbage pick-up service as needed. No trash cannisters, bags or cans shall be visible from outside of a unit. All trash must be deposited in common dumpsters maintained by the Association. Any requirement for additional disposal needs beyond the normal daily amount, such as that required by a construction project, must be approved by the Association.
53. Mail boxes are not permitted on units. The Association shall provide a central location for mail to be received by each unit. The mail box location and/or delivery system shall be subject to change as required by the growth of the development. No owner, tenant or guest may use the development's street address to receive mail.
54. No motorhome structure or any other improvement my be permitted to fall into disrepair, and each unit must be kept and maintained in a clean, safe, attractive and slightly condition and in good repair, adequately painted or otherwise finished by the owner.

SECTION #17

General Welfare

Item #17

The Impact of the Proposed Project on Public Health, Public Safety, or the General Welfare of the County.

Throughout the entire CUP application, we have, in great detail, outlined the technical means of how we are positively addressing the public health, safety, and general welfare (HSW) of Door County. It is our position that the HSW of the county will be greatly enhanced with this development in place.

To truly understand the entire concept of HSW, it is important to understand the overall definition:

- **Public health** is the science and art of preventing disease and promoting health through organized efforts and informed choices of society.
- **Public safety** is the state of being reasonably free from risk, damage, or injury.
- **Public welfare** is the act of contributing to economic sustainability, creating community, and allowing communities to function more effectively.

As mentioned above, numerous specific, detailed items have been mentioned throughout the application. While we don't feel it is necessary to repeat in detail the items affecting HSW, we want to provide the following:

Public Health

- We are reclaiming an abandoned quarry. Currently there no means or methods to control groundwater contamination. All infrastructure improvements (controlling stormwater runoff, installation of approved potable water system, installation of sanitary septic collection system) will meet all local and state codes.
- Conversations with the existing owners of the subject property, reveal continuous disposing of misc. debris on the subject property. Household trash, used tires, and even items such as worn out wash machines have been illegally disposed on the property. Onsite management will eliminate, the general public from disposing of the misc. debris on the subject property.

Public Safety:

- Conversations with the existing property owners reveal numerous times of trespassing on the subject property. Not only is the trespassing an illegal act, there is an inherent risk of severe injury given the topography of the quarry. The issue of trespassing will be greatly reduced, if not eliminated, by having a gated community with onsite management.
- Fire Protection outside the development will be improved with the availability of the dry hydrant installed within the development.

Item #17 -- continued

Public Welfare:

- The economic impact of this project is substantial. The construction phase of the project will provide hundreds of jobs as well as millions of dollars of local economic impact. The operational phase of the development will provide numerous full and part time jobs. Annual tourism dollars will be increased. Increased real estate taxes will be considerable. A whole new customer base will be marketed and sold to that is presently underserved in Door County. The demographics of the buyer will allow for a very significant financial contribution to the local economy. A detailed examination of the total economic impact is included toward the end of the CUP application.

SECTION #18

Additional Topics

Item #18

The Resource Planning Committee is allowed consider topics in addition to the above. Please provide information on additional topics you think the Committee should or may consider in evaluating the project.

We feel following additional items should also be reviewed:

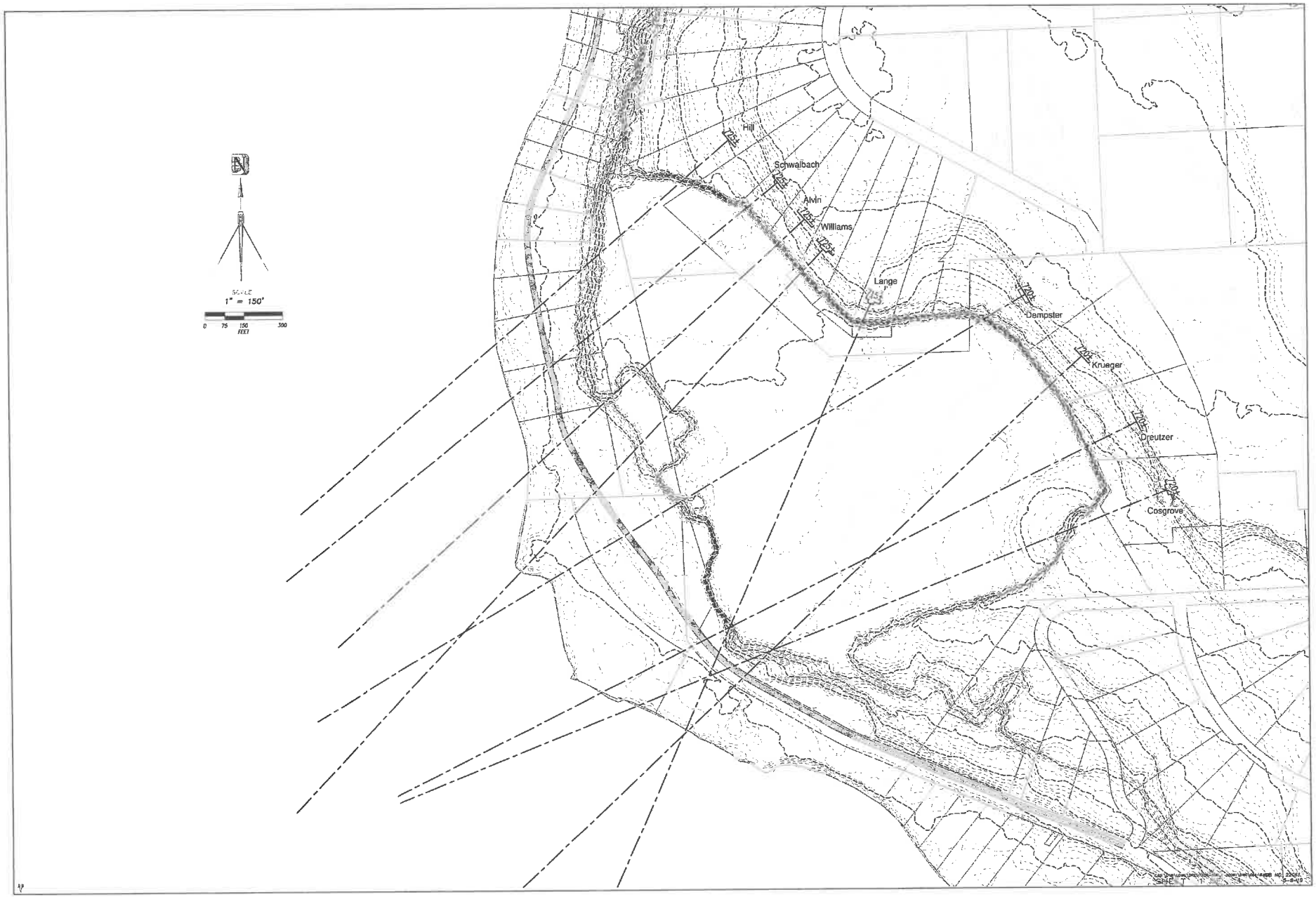
- Site Lines
- Historical Importance
- Economic Impact
- Construction Concerns
- Demographics / Class A Motorcoach Industry
- Wisconsin Act 67

Item #18

Sight Lines

Extensive time and effort have been taken to ensure that various views will be minimally affected. Sight lines from the existing easterly owners view above the development were looked at to ensure that their westerly water view is not compromised. (See Attached) The view from below the development from Cty Hwy B was also examined. The upward view from the county highway seeing any structures is minimal. The pumping station located along Cty Hwy B will be heavily landscaped providing little if any view of the pumping process. The main entrance along Hwy Cty B will be landscaped in such a fashion to minimize views of the entrance, but the same time does not create any safety issues during ingress and egress.

A second important point of discussion is the fact that the current owner of the subject property (Peg Druetzer), as well as owner of numerous shoreline lots both north and south of the subject property has agreed to a perpetual view cutting agreement where trees, as they grow, and obstruct water views from the subject property, as well as easterly property owners above the development, can be selectively trimmed to provide better water views. This trimming agreement will in most cases, enhance water views for the easterly property owners currently living above the subject property.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FEET
Hill
Schwalbach
Ahlin
Williams
Lange
Dempster
Krueger
Dreutzer
Cosgrove

Cosgrove Profile

SCALES:
HORIZ. - 1" = 100'
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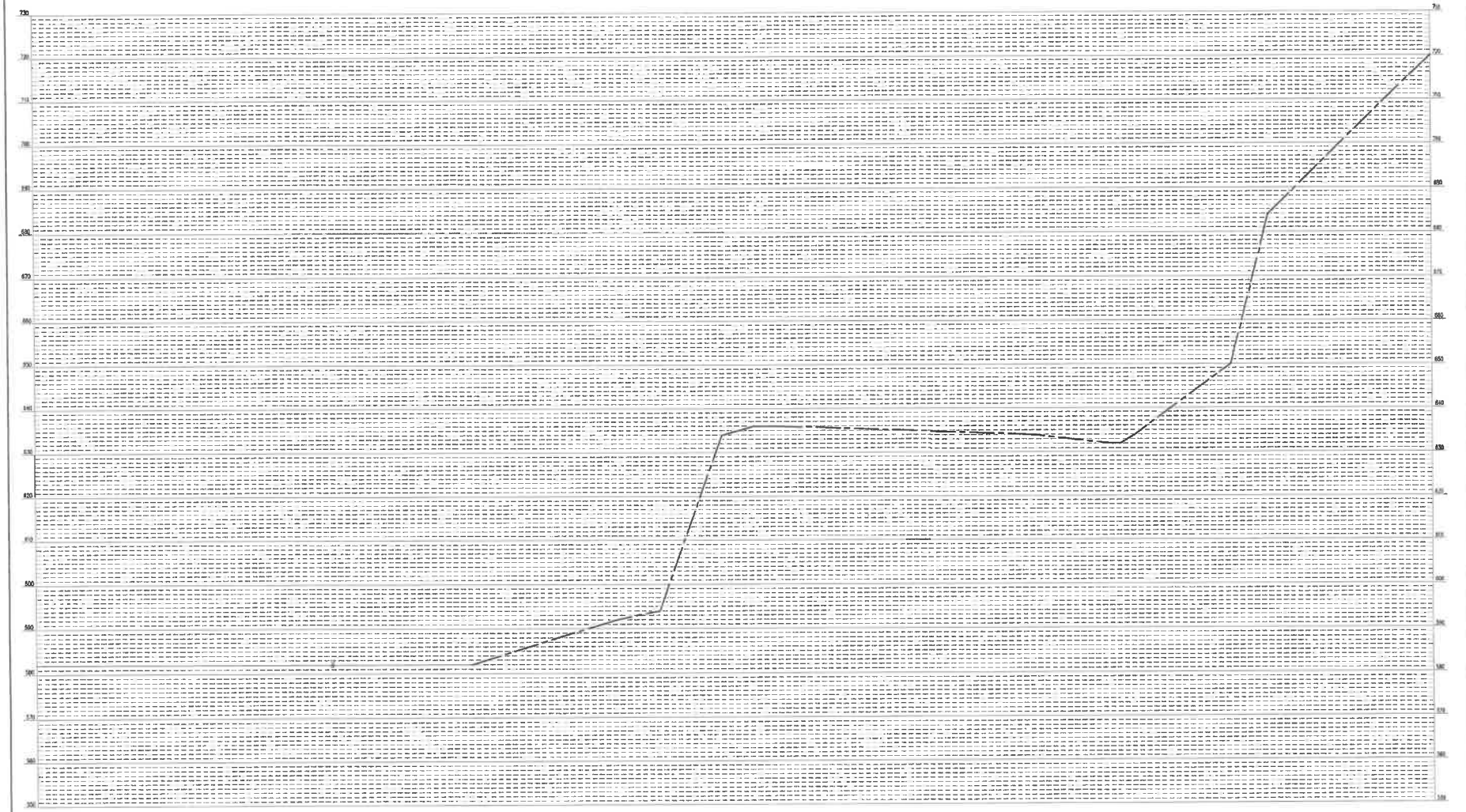

SHEET 1 OF 1

Dreutzer Profile

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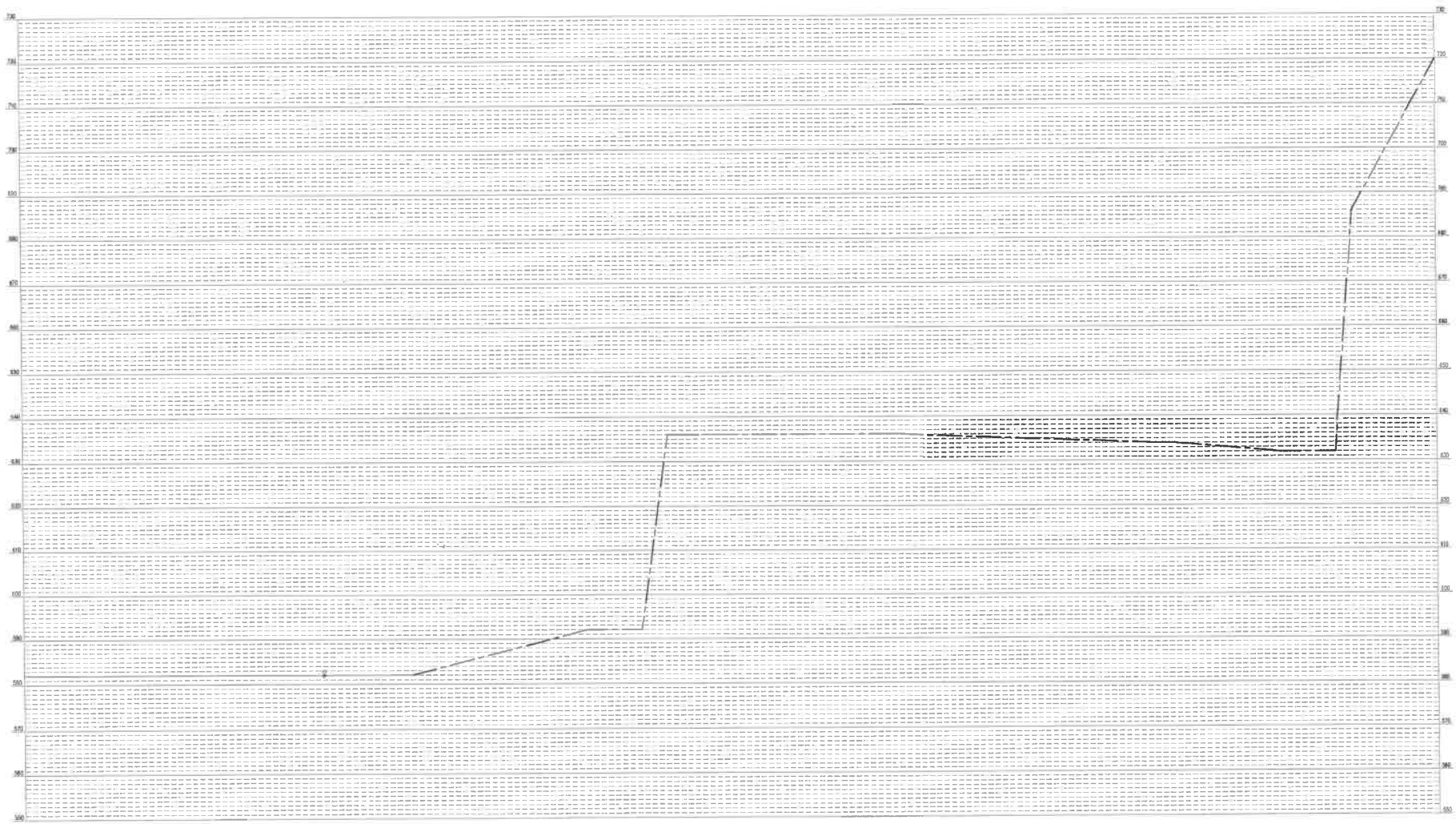

Krueger Profile

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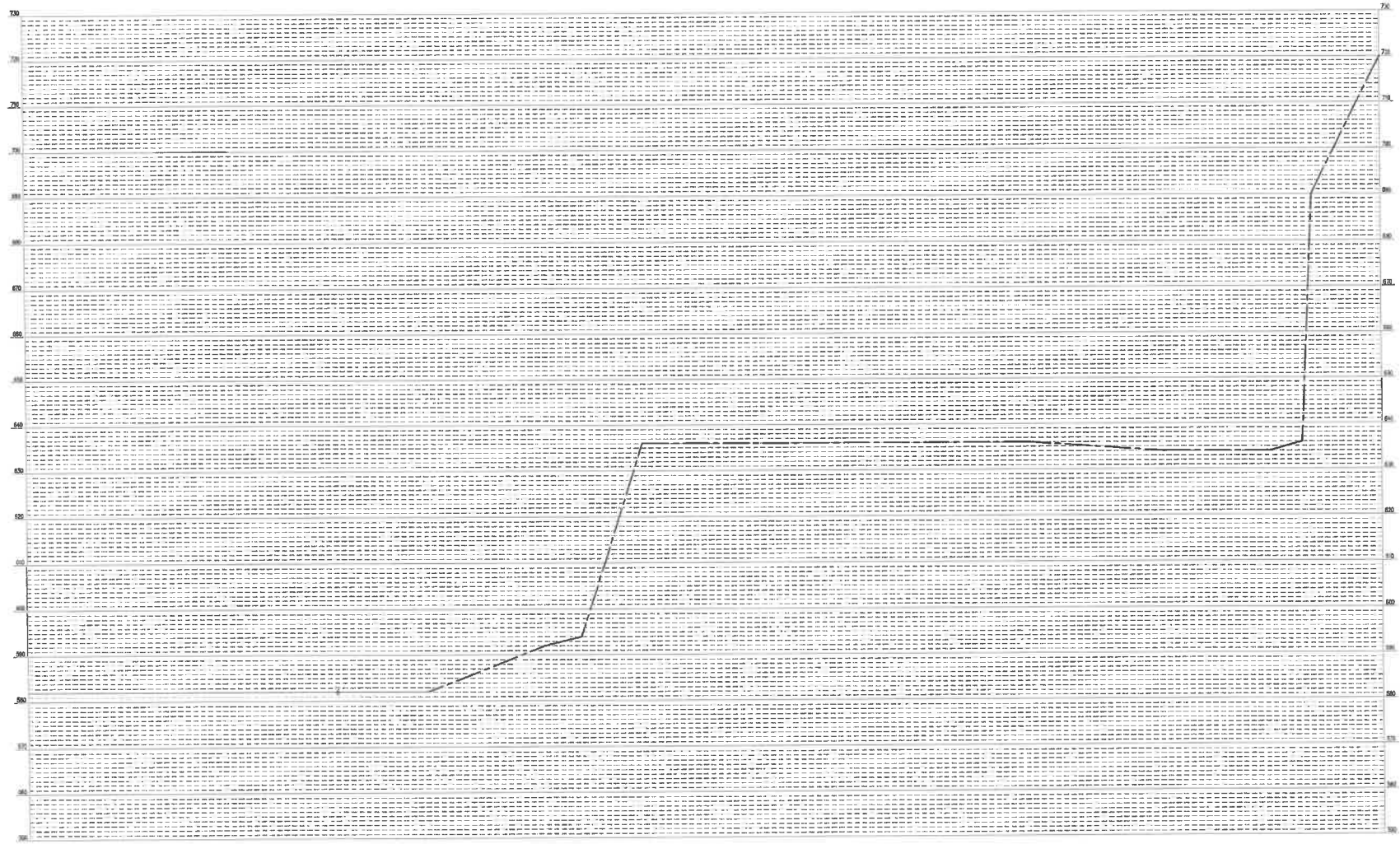

Dempster Profile

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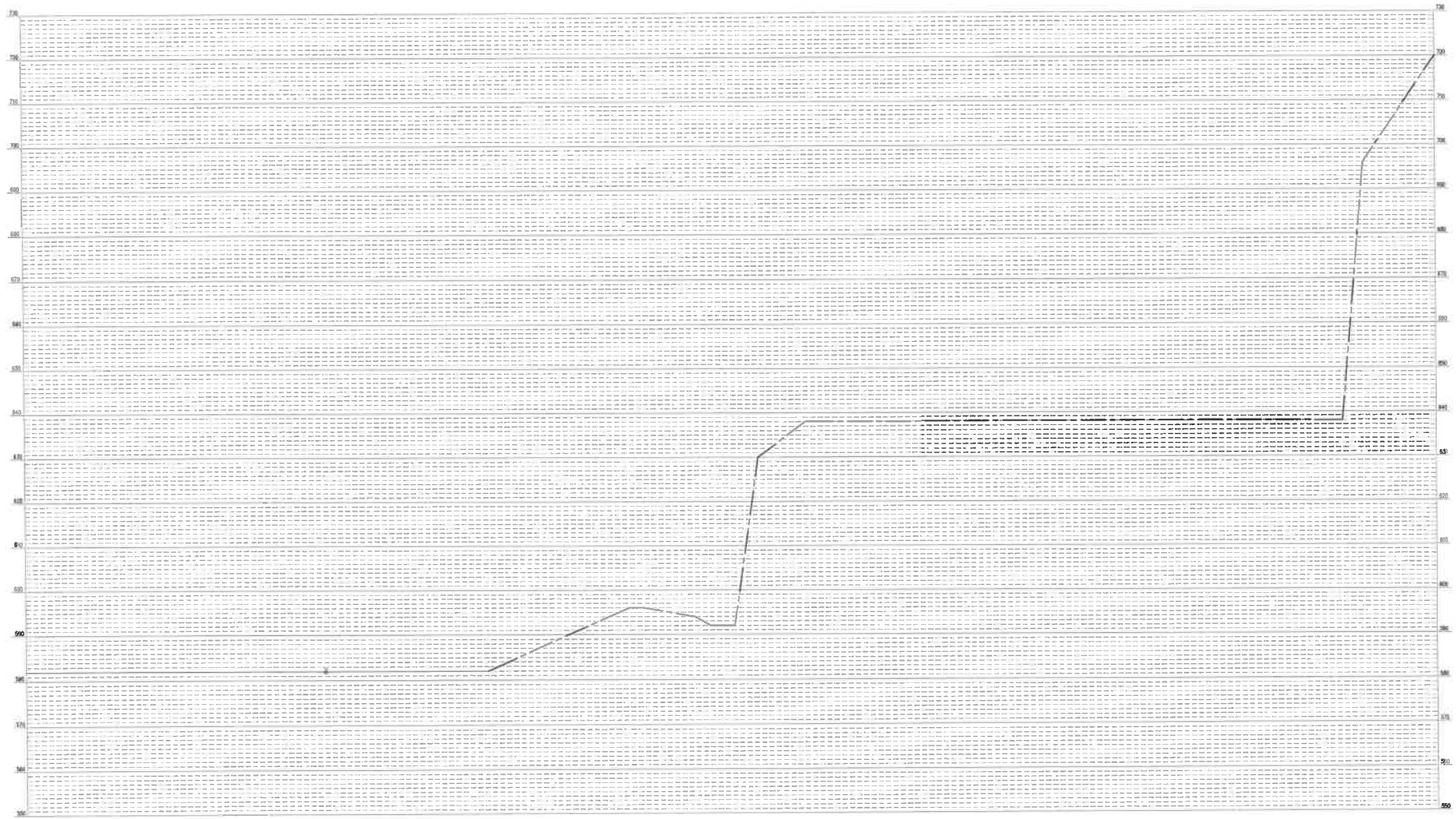

SHEET 1 OF 1

Lange Profile

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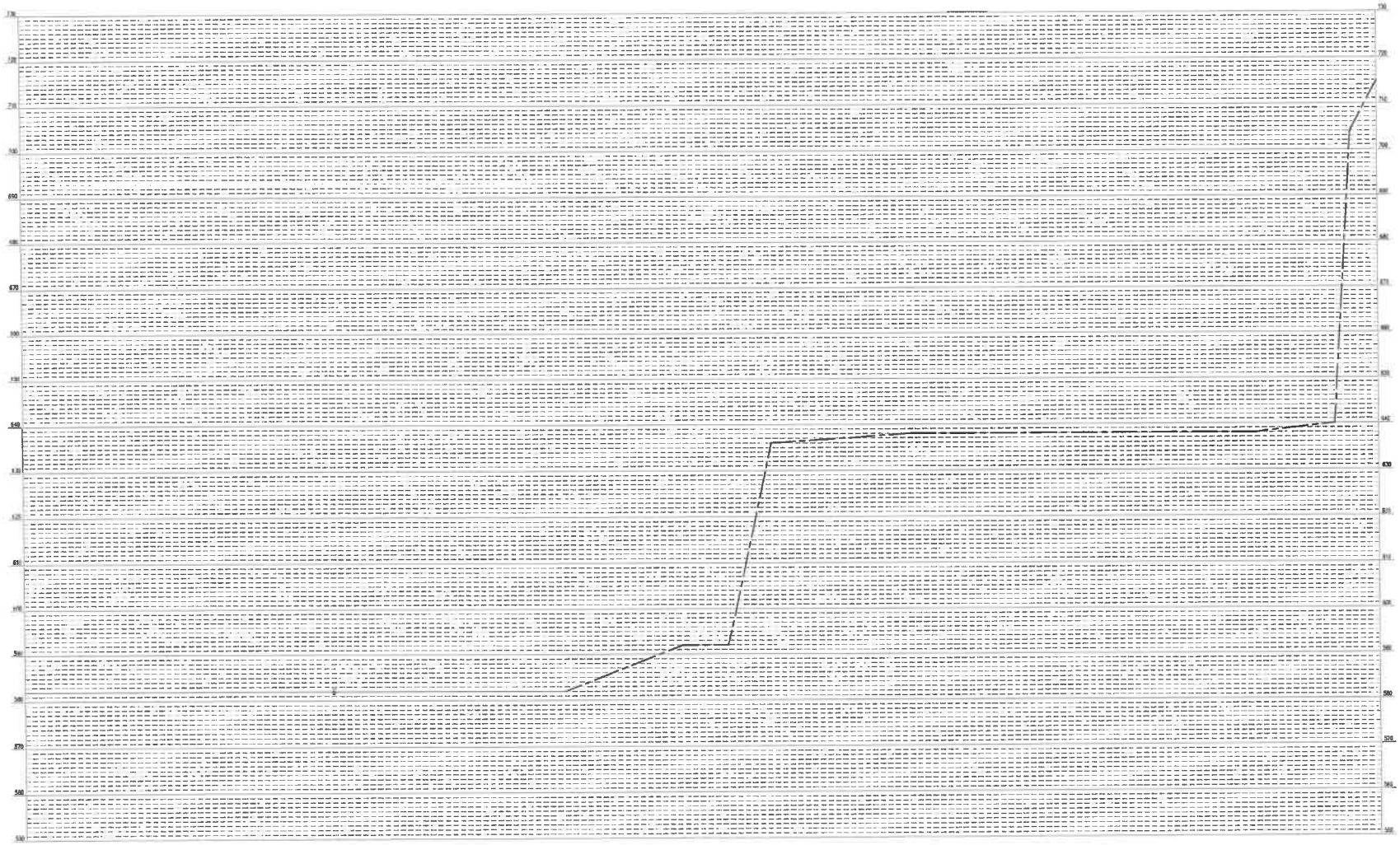

Williams Profile

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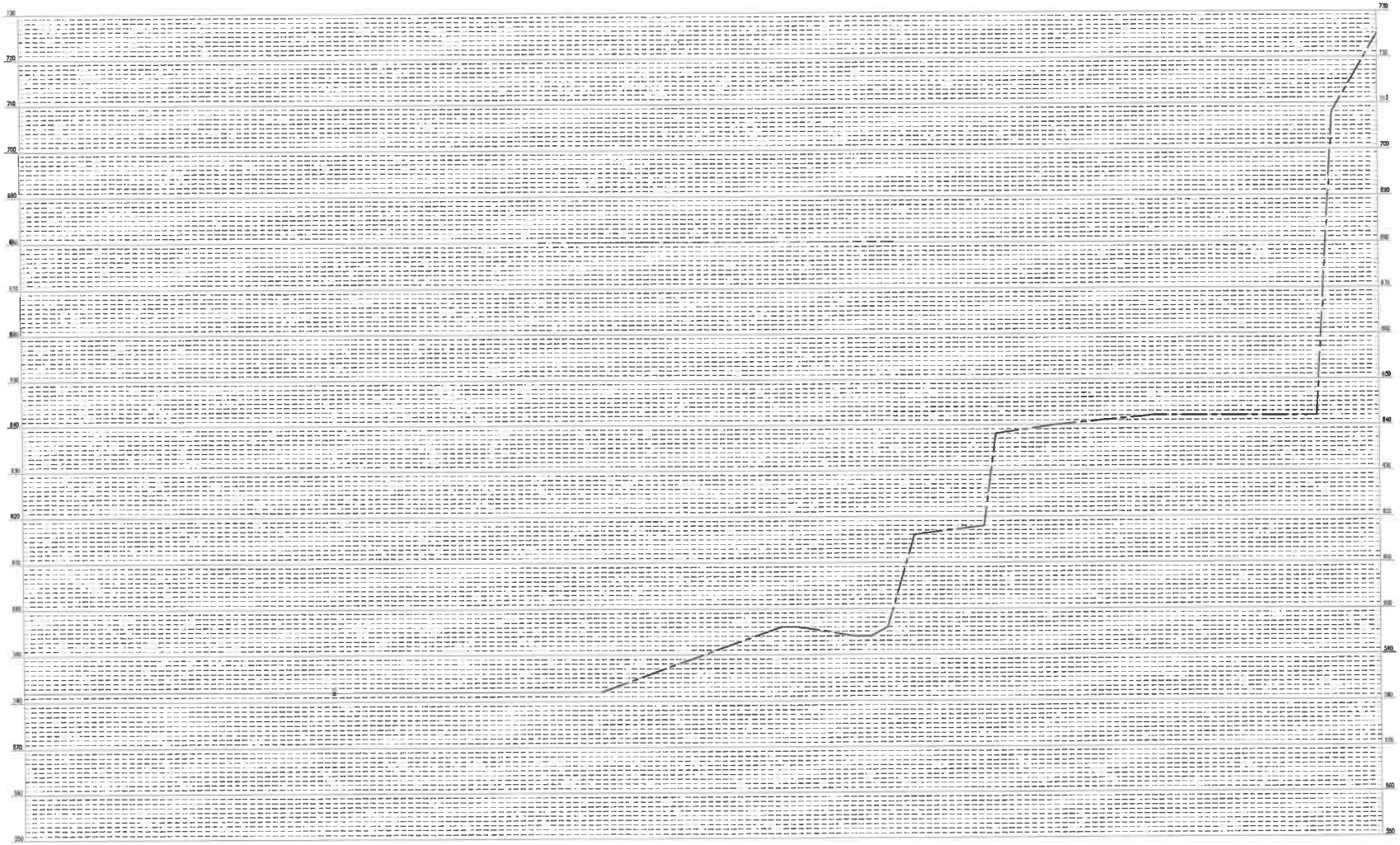

SHEET 1 OF 1

Alvin Profile

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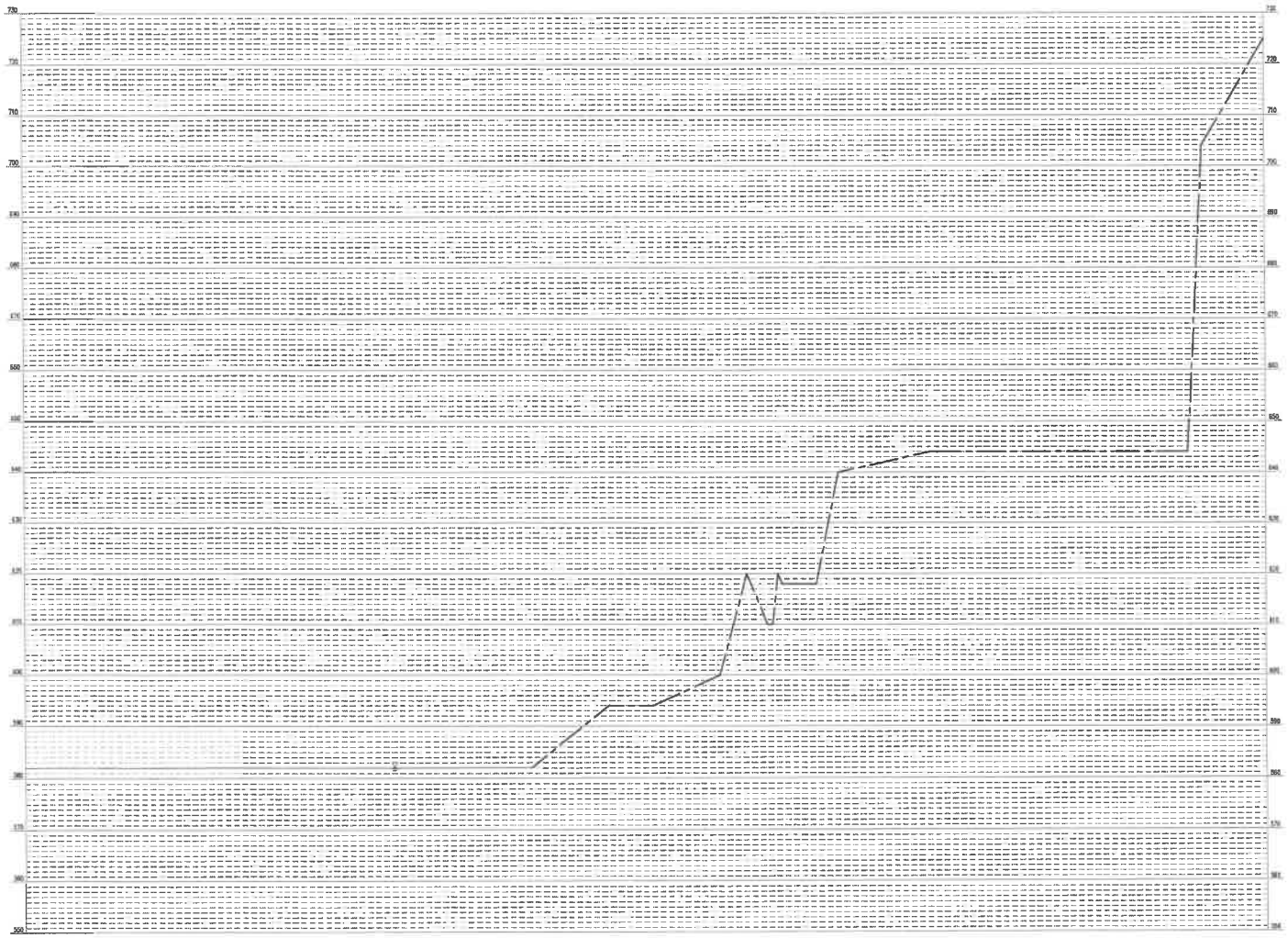

SHEET 1 OF 1

Schwalbach Profile

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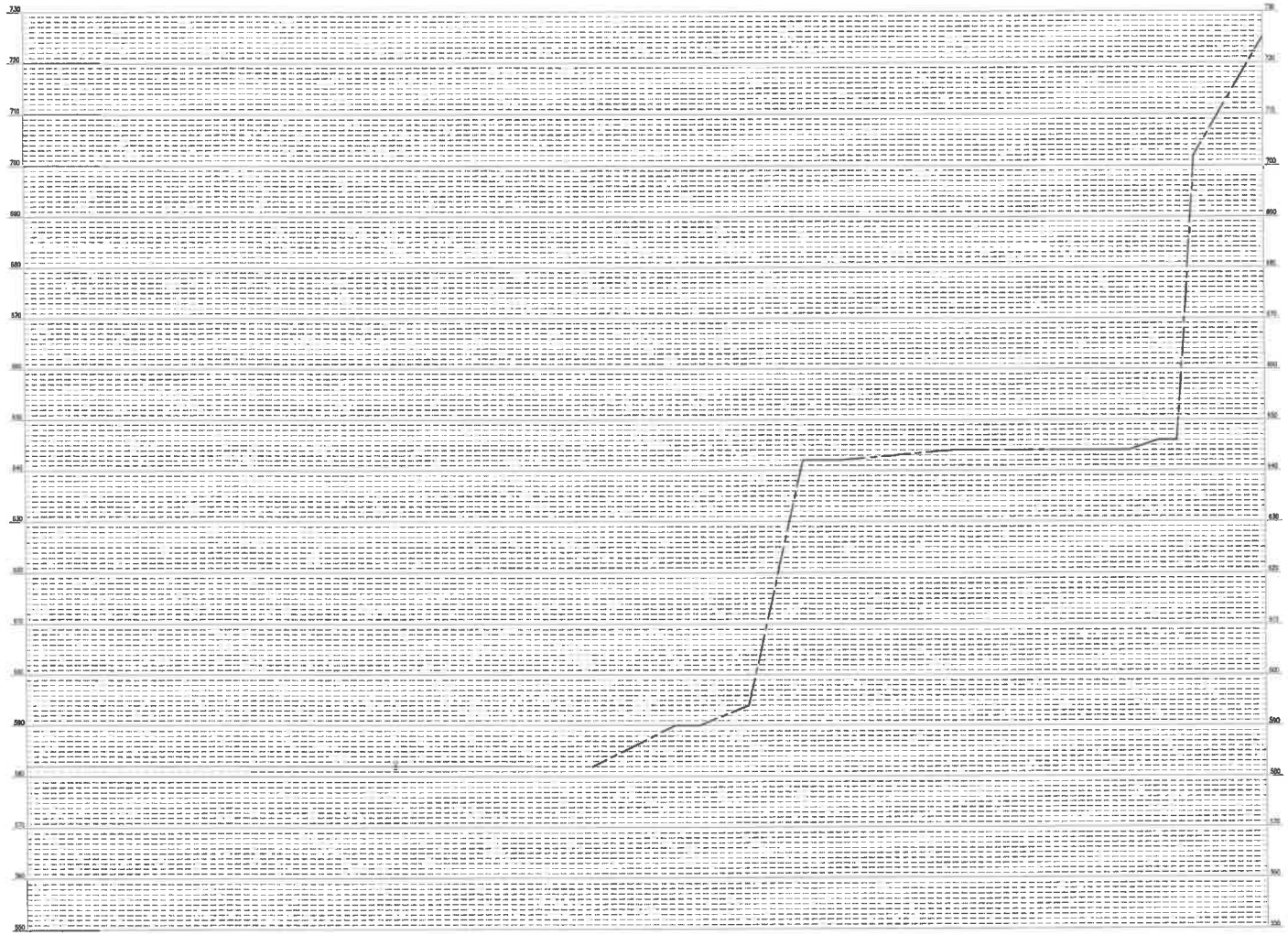

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SHEET 1 OF 1
5-8-19

Hill Profile

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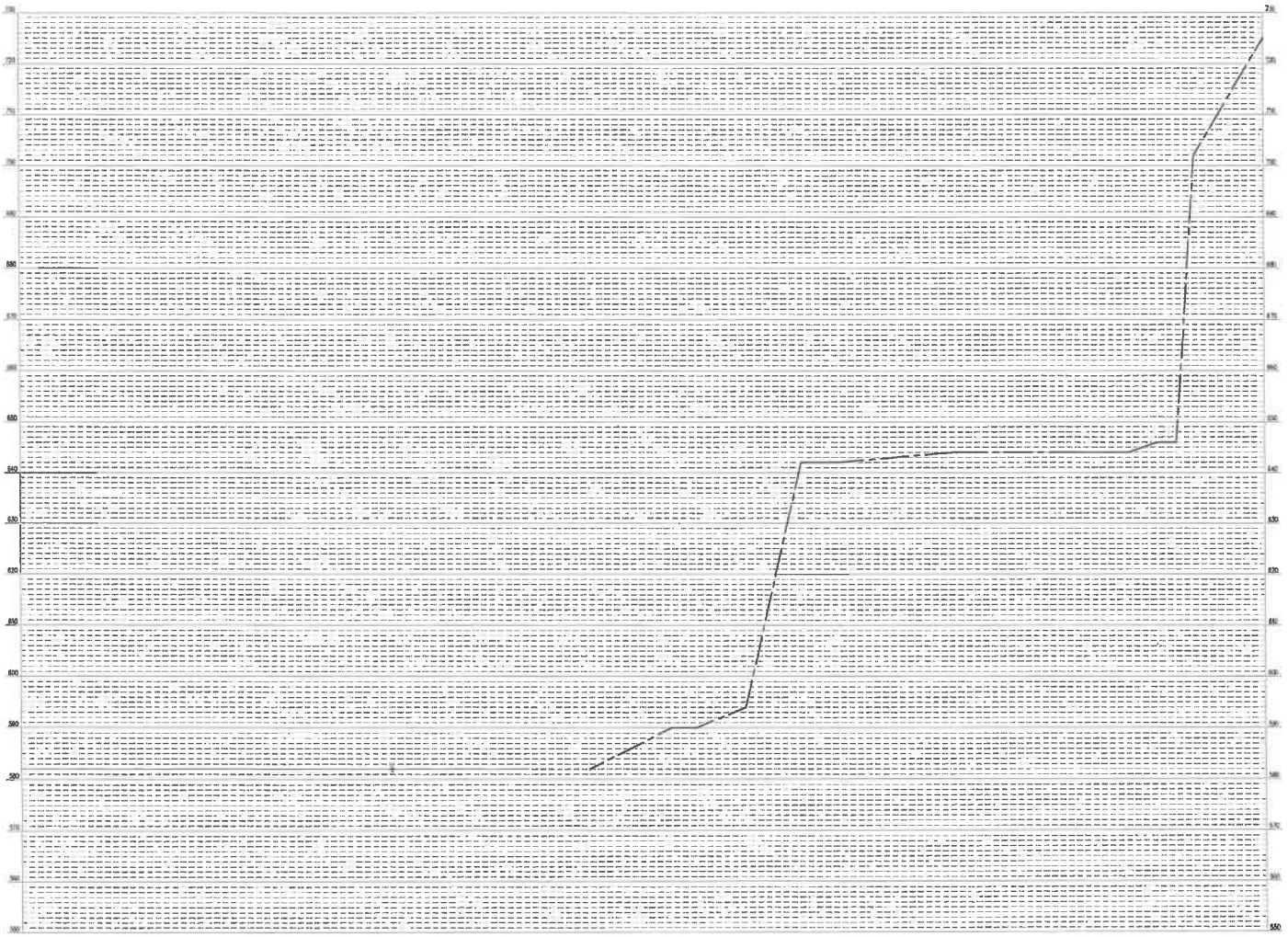

onyx | creative
25001 EMERY ROAD #400, CLEVELAND, OH 44128

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Schwalbach Residence- 6435 W. Whitefish Bay Rd
Meadow Wood Homes LLC • DOOR COUNTY, WI • 07.08.19

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Item #18

Historical / Archaeological Importance

The, DNR, while performing its due diligence for storm water approval notified the developers of the possibility of structures of historical interest being located within the subject property. Conversations took place with State Archaeologist, Ricky Kubicek explaining that the specific structures in question were not located on the subject property. Mr. Kubicek, after reviewing information provided to him, did concur, and no further action was necessary.

We are aware of the historical importance of keeping the quarry in a natural state and that the quarry is part of a unique geological formation – the Niagara Escarpment. There are no plans to disturb/change any of the vertical walls or major rock outcroppings. The only changes that will take place will be on the flat surface areas. We are aware that numerous geological groups visit the property for its geological importance. We plan on continuing this access.

Our development plan includes constructing numerous information pieces to educate owners/visitors of the unique characteristics and history of the quarry property. We plan on displaying as many historical photos, artifacts, and stories as possible.

Item #18

Economic Impact of the Development

A project of this size and scope has an enormous economic impact. This project is catering to a very high net-worth individual. Historically, buyers in this type of development will be in their late 50's to late 70's. Their W2 reveals annual incomes in the $150k range and higher. Net worth statistics are difficult to obtain, but it can be assumed that the individual buyer is in the very upper end net worth category. Furthermore, we are addressing a need in Door County that is not being met. Other than a few campgrounds located in the county that set aside a couple of campsites, there isn't a facility that caters 100% to the Class A motor coach market. We have been in contact with several motor coach groups located in the upper Midwest and specific comments have been made that Door County is seldom chosen as a destination simply by the fact that there is not a facility that caters to their needs.

To realize the extent of the economic impact to the local economy of this project during the construction phase, as well as the operational phase, i.e. ongoing costs to maintain the structures and infrastructure, the National Association of Home Builders (HAHB) is engaged to provide an in-depth study. (The study will be completed in the next week or so and be presented to the county once received.) The HAHB report is site specific and takes in account the following:

- Local Sales Tax Paid
- Number of Homes Built and Average Sales Price
- Cost of Land
- Cost of Infrastructure Improvements
- Local Property Tax Rates

In summarizing the intent of the report:

"The model captures the effect of the construction activity itself, the impact that occurs when income earned from the construction activity is spent and recycles in the local economy, and the ongoing impact that results from homes being occupied by residents who pay taxes and buy locally produced goods and services."

Local Real Estate Taxes

Currently the assessed value of the subject property is approx. $225,000, which generates approx. $2,200 in annual real estate taxes. At full build-out, assuming 80 homes are built, the total assessed value will be in the $40M range generating approx. $400,000 in local real estate taxes. (See attached summary for breakdown to schools and municipalities.)

Tourism Spending

At full build-out, the development will bring, at a minimum of 200 to 400 additional "tourists" to Door County annually. Again, with the demographic make-up of owners and their friends, a substantial amount of spending will be introduced to the local economy.

Quarry Project
Economic Impact -- Real Estate Taxes

Project Current Assessed Value -- $225,000

Projected Assessed Value Completed Project -- $40,000,000 (Conservitive)

Tax Breakdown	Rate	Current Tax	Projected Completion Tax
Door County	0.41897%	$942.68	$167,588.00
Town of Sevastopol	0.09320%	$209.70	$37,280.00
Vocational School	0.08255%	$185.74	$33,020.00
Sevastopol School	0.47556%	$1,070.01	$190,224.00
	Total Yearly Tax	**$2,408.13**	**$428,112.00**

		Percent Make-up Entire Budget
Town of Sevastopol 2018 Budget	**$1,126,437**	**3.31%**
Sevastopol Schools 2018 Budget	**$7,000,000**	**2.72%**

THE POWER OF TRAVEL

Tourism plays a significant role in Wisconsin's economy and is a significant source of both employment and tax revenue.

- Tourism had a $20.6 billion impact on the state's economy in 2017, up $631 million, or 3.2% from $20 billion in 2016.
- Since 2011, the growth of tourism activity is up more than $5.8 billion, a nearly 40% increase from $14.8 billion.
- Direct visitor spending in 2017 totaled $12.7 billion statewide, an increase of $390 million, or 3.2%, over 2016.
- Visitor spending growth in 2017 was led by spending on recreational activities, with strong growth in the food and beverage and lodging sectors.
- WI visitor volume topped 110 million in 2017, a seven-year increase of 17.5 million.
- The tourism economy generated $1.5 billion in state and local tax revenue and $1.2 billion in federal taxes. Without tourism, each Wisconsin household would pay an additional $660 to maintain existing services.
- Tourism directly and indirectly supported 195,255 jobs in Wisconsin in 2017.
- Tourism spending supports 7.7% of all jobs in Wisconsin.

WISCONSIN
DEPARTMENT OF TOURISM

THE POWER OF WISCONSIN TOURISM

ECONOMIC IMPACT FACT SHEET

DOOR COUNTY

Surrounded by Lake Michigan, Door County, Wisconsin is a collection of 19 communities working together to promote the region as a single destination. It has been a popular vacation retreat for more than a century and continues to provide visitors with scenic seaside experiences in the heart of the Midwest. Tourism is big business in Door County, as indicated by these facts and figures from 2017:

VISITOR SPENDING

- Direct visitor spending in Door County totaled $358.7 million in 2017, an increase of $10.9 million *(3.14%)* from the $347.8 million visitors spent in 2016.
- The nine-year growth of direct tourism spending in Door County is up $101.6 million, an increase of 39.5% from the $257.1 million that was spent in 2009.
- Tourism had an overall impact of $456.9 million on Door County's economy in 2017, up $14.1 million (3.18%) from $442.8 million in 2016. *This total includes both direct and indirect tourism spending.*

EMPLOYMENT

- The tourism industry supported a total of 3,225 jobs in Door County last year, an increase of 1.5% over 2016.
- Total labor income of $78.5 million was generated for employees in Door County last year as a result of tourism spending, an increase of 4.37% over 2016.
- Almost entirely comprised of small businesses, travel and tourism related jobs in Door County can't be outsourced or exported.
- The tourism industry provides work across the spectrum of employment from entry level and part-time jobs to management, executive and entrepreneurial positions.

TAX REVENUE

- Tourism in Door County generated $38.5 million in state and local taxes in 2017, an increase of $1.1 million *(2.95%)* over the $37.4 million in state and local taxes collected in 2016.

DID YOU KNOW...

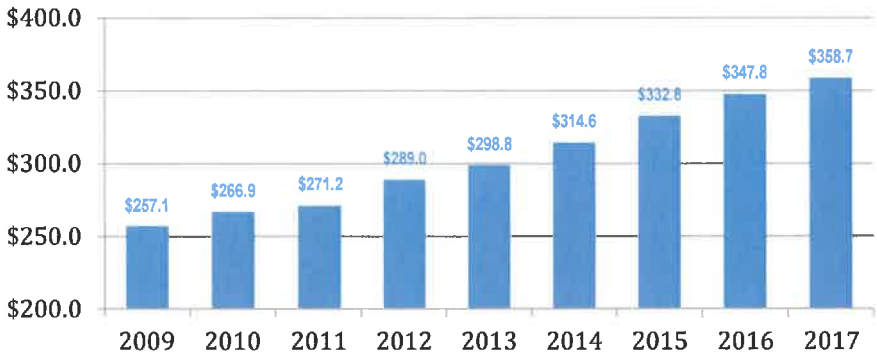
- Door County ranked 7th out of 72 counties in 2017, generating 2.82% of all direct visitor spending in Wisconsin.

Source: Tourism Economics: The Economic Impact of Tourism in Wisconsin

- more next page -

Visitor Spending

(in millions)

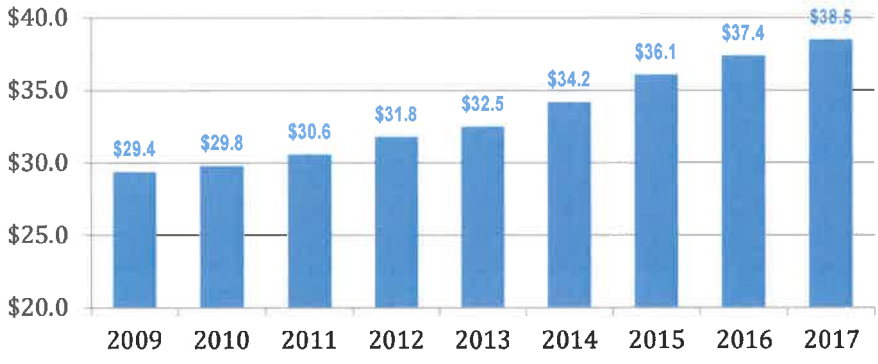


In 2017, visitor spending in Door County increased by $10.9 million, or 3.14% over 2016.
Since 2009, visitor spending is up 39.5%, an increase of $101.6 million over 9 years.

Source: Tourism Economics: The Economic Impact of Tourism in Wisconsin

State & Local Taxes

(in millions)



In 2017, state and local tax revenue generated by visitor spending in Door County increased by $1.1 million, or 2.95% over 2016.

Source: Tourism Economics: The Economic Impact of Tourism in Wisconsin

Room Tax Collections

(in millions)

In 2017, room tax collections in Door County were up 4.52% over 2016, and up 52.72% over the baseline year of 2009, the first year that all 19 Door County municipalities were part of the Door County Tourism Zone.

Source:
Door County Tourism Zone Commission

The Door County Visitor Bureau is the official tourism marketing organization for Door County, whose mission is to generate incremental economic impact for the community by attracting visitors with strategies that ensure sustainable tourism.

Construction Concerns

As developers, we are aware of concerns during the construction process. In reviewing letters of concern, we are addressing the following:

- It is our intent to start construction in 2020. There will be a time frame of approx. four to eight months for bulk site work, road work and utility installation. All blasting will be completed in this initial timeframe. All stormwater infrastructure will also be completed during this time. Our proforma plan is to have 20 units built and sold within 24 months from the completion of the initial sitework. Full build-out is planned to take place in less than 10 years.

- Blasting will be a part of the construction process. Blasting will be required for pond construction and utility installation. Blasting is a normal part of construction, especially in Door County. There are specific guidelines to meet in regard to noise, dust, and the actual blasting process. Federal guidelines are enforced by MSHA (Mine Safety, Health Administration) as well as ATF (Federal Bureau of Alcohol, Tobacco and Firearms) In addition, the State of Wisconsin DNR is also intimately involved in strict blasting guidelines. An in-depth, site-specific, blasting report is being prepared by a firm – Vibra-Tech., located in Chicago, IL. Vibra-Tech is national known company, specializing in all aspects of rock blasting from pre-blast and post-blast inspections, blast monitoring, as well as educating the public regarding blasting protocol. The report should be completed in the next few days and forwarded to the county once completed.

- Crushing of onsite aggregate materials will also take place. Road gravel, screened stone, as well as manufactured sand will be produced onsite. Basically, all aggregate materials needed for construction will be produced onsite. No aggregate materials will be needed to be imported to the project site. Noise, dust, and the crushing process is strictly monitored by MSHA, as well as the DNR. Please see attached for more in-depth responsibilities.

- There is approximately 20,000 cubic yards of useable topsoil material onsite that will provide a majority, if not all, of the topsoil needed for landscaping. The topsoil has been tested (see attached) for nutrients and also to ensure that it is safe from contaminants and suitable for lawn establishment as well as other landscaping needs. If additional topsoil is needed, we have been in contact with a local excavating contractor who has sources of topsoil outside the county and is willing to assistance in obtaining needed topsoil. Of course, any imported topsoil would be tested for containments, as well as confirm that it is being purchased from an approved code compliant source.

GeoSonics Vibra-Tech

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Mike Spors, E.I.T.

Area Manager

Mike has worked for Vibra-Tech Engineers, Inc. since 2007. He provides vibration monitoring and consulting for mining and construction projects throughout Illinois, Wisconsin, Minnesota, Iowa, Indiana and the Upper Peninsula of Michigan. He also regularly conducts pre-blast and post-blast inspections, damage claim investigations, educates neighboring property owners on blasting and construction vibrations and trains clients on the proper setup and use of seismographs. In addition, Mike has assisted with and presented at numerous public permit application hearings, neighborhood meetings, open houses and has provided legal testimony as an expert witness.

Education:

- BS – Electrical Engineering, San Diego State University, 2006

Professional Registration:
Registered as a Professional Engineer-In-Training (E.I.T.)
Illinois #061-033942

Professional Memberships:

- Board Member, International Society of Explosive Engineers (ISEE), Great Lakes Chapter (Chicago)
- International Society of Explosive Engineers (ISEE), Lake Superior Chapter (Minnesota)
- Illinois Association of Aggregate Producers (IAAP)
- Aggregate Producers of Wisconsin (APW)

Contact Information:
mikes@vibratechinc.c
630-858-0681

Location:
Chicago, IL

Expertise:
Vibration Monitoring
Pre/Post Inspections
Damage Claim Investigations

- Iowa Limestone Producers Association (ILPA)
- Indiana Mineral Aggregates Association (IMAA)

Professional Experience:

Mike is currently the Area Manager for the Chicago office, which services the Upper Midwest. He is responsible for all operations of the office. During his career at Vibra-Tech, Mike also held the Field Engineer position where he installed and maintained Re:moteTM seismograph stations, monitored vibration as well as collected and analyzed data to produce client reports. He has served as a vibration consultant for the aggregate and construction industries on a variety of large scale projects such as the reconstruction of Wacker Drive in Chicago, William Eckhardt Research Center at the University of Chicago, construction of the Epic Systems Corp. campus in Verona, Wisconsin and numerous high-rise construction projects.

Publications:

- Re:Con 2016 – The Conference for Managing Blast-Associated Risk, Blasting Near Buried Pipelines, 2016
- ISEE, Lake Superior Chapter, MinnBlast – Safety & Training Conference, Seismology 101, 2008 – Present
- Wisconsin Department of Commerce – Blaster's Conference, Seismology 101, 2009 & 2011

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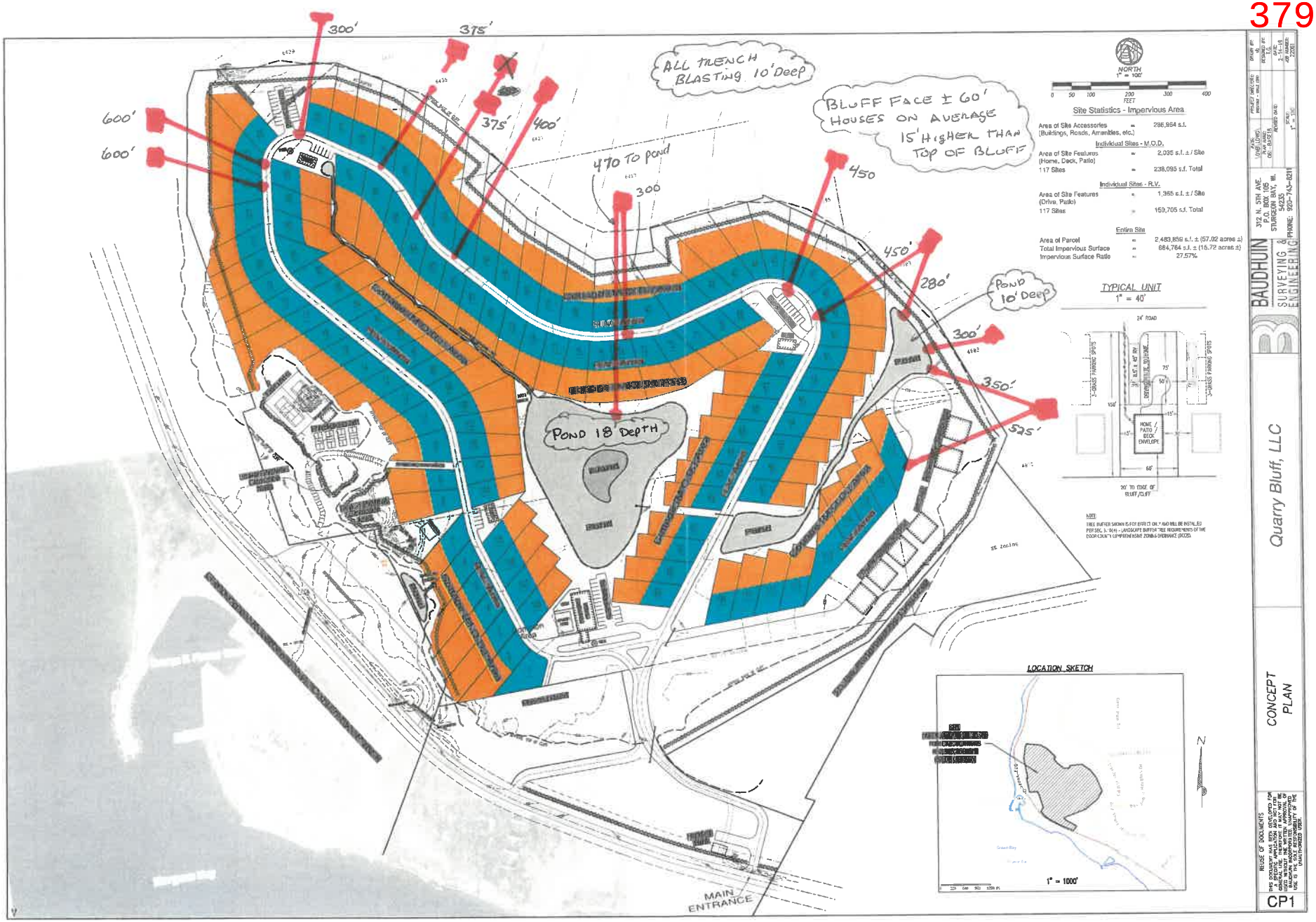


300'
375'
600'
600'
375'
400'
470 To pond
300
450
450'
280'
300'
350'
525'
ALL TRENCH BLASTING 10' Deep
BLUFF FACE ± 60' HOUSES ON AVERAGE 15' HIGHER THAN TOP OF BLUFF
POND 10' Deep
POND 18' DEPTH
NORTH
1" = 100'
0 50 100 200 300 400
FEET
Site Statistics - Impervious Area
Area of Site Accessories (Buildings, Roads, Amenities, etc.) = 286,954 s.f.
Individual Sites - M.O.D.
Area of Site Features (Home, Deck, Patio) = 2,035 s.f. ± / Site
117 Sites = 238,095 s.f. Total
Individual Sites - R.V.
Area of Site Features (Drive, Patio) = 1,365 s.f. ± / Site
117 Sites = 159,705 s.f. Total
Entire Site
Area of Parcel = 2,483,859 s.f. ± (57.02 acres ±)
Total Impervious Surface = 684,764 s.f. ± (15.72 acres ±)
Impervious Surface Ratio = 27.57%
TYPICAL UNIT
1" = 40'
24' ROAD
3-GRASS PARKING SPOTS
HOME / PATIO / DECK ENVELOPE
20' TO EDGE OF BLUFF/CLIFF
NOTE:
TREE BUFFER SHOWN IS FOR EFFECT ONLY AND WILL BE INSTALLED PER SEC. 3.1 (4) - LANDSCAPE BUFFER TREE REQUIREMENTS OF THE DOOR COUNTY COMPREHENSIVE ZONING ORDINANCE (DCCZ).
LOCATION SKETCH
1" = 1000'
N
MAIN ENTRANCE
BAUDHUIN SURVEYING & ENGINEERING
312 N. 5TH AVE.
P.O. BOX 105
STURGEON BAY, WI.
54235
PHONE: 920-743-6211
Quarry Bluff, LLC
CONCEPT PLAN
REUSE OF DOCUMENTS
CP1

Rock crushing

The rock crushing or aggregate producing industry has a range of environmental regulations that impact their operations. The following links provide some basic information on those requirements.

Air pollution regulations

- Fact sheet on Particulate Matter Emissions and Pollution Requirements (AM-406) [PDF]
- To help facilities calculate air emissions, DNR and the crushing industry worked together to develop the Nonmetallic Mining Emission Calculations Based on 1998 Nonmetallic Mining Agreement (AM-498) [PDF] - see page six for details.

Fugitive dust control

"Fugitive dust" is a term used to describe any particulate matter (PM) emissions released through any means other than a stack or duct of some kind. Any business creating enough dust, smoke, or fumes to be a noticeable source of air pollution must control those emissions. The following are examples of activities that would create fugitive dust:

- large trucks transporting materials along unpaved roads
- unpaved parking lots
- piles of materials stored on site—like grain
- dry materials directed to equipment not collected by another device—whether by baghouse, cyclone, wet scrubber, etc.

Any business that creates fugitive dust must do as much as possible to control those emissions and keep them from escaping into the environment. The following are a few suggestions based on the type of activity. Other best management practices recommended by industry experts are provided in the fact sheet Fugitive Dust Management (AM-556) [PDF].

- For roads or storage piles, this may mean using water or chemicals to prevent dust plumes. Paving roads will reduce dust. Storage piles can be kept within a three-sided building to minimize emissions.
- To know how much of an additive is allowed in water for dust prevention, refer to the storm water standards for Water quality review procedures for additives [PDF], and the two companion documents: Allowable usage rates for water applied additives [PDF], and Allowable usage rates for land applied additives [PDF].

- Mechanical collection devices (i.e. cyclones and dry filters) are effective, low cost ways to control PM emissions from processing equipment. Unfortunately, higher collection efficiency in any type of equipment can often mean higher costs. For example, a baghouse can be a very high efficiency control option but is more expensive than the others.

Other regulations

- Under the DNR's mines, pits and quarries page there is a link to other publications and resources for crushers, or nonmetallic mining publications and resources.

LAWN & GARDEN SOIL RESULTS

AgSource LABORATORIES

Submitted by **BN01151**
MIKE PARENT
PO BOX 889
SISTER BAY, WI 54234

Submitted for
Mike Parent

Laboratory Sample #
BR14562

Date Received
8-Nov-2019

Date Reported
12-Nov-2019

Information Sheet #
738919

SUMMARY REPORT OF ANALYTICAL RESULTS

Sample Number	% Organic Matter	Nitrate N ppm	Phosphorus ppm	Potassium ppm	Magnesium ppm	Calcium ppm	Sulfur ppm	Zinc ppm	Manganese ppm	Copper ppm	Iron ppm	Boron ppm
1	1.5	----	4	32	73	3052	397.3	6.7	5.2	6.0	108.9	0.5
Average	----	----	----	----	73	3052	397.3	6.7	5.2	6.1	108.9	0.5

SUMMARY OF ANALYTICAL RESULTS

CATION EXCHANGE CAPACITY

Sample Number	Soil pH	Buffer Index	Soluble Salts dS/m	Sodium ppm	Bulk Density	ACTUAL % OF TOTAL CEC % K	% Mg	% Ca	% Na	% H	Total CEC
1	7.8	----	----	10	1.20	0.5	3.7	95.5	0.3	0.0	16.0
Average	----	----	----	10	----	0.5	3.7	95.5	0.3	0.0	16.0

DISCLAIMER: Data and information in this report are intended solely for the individual(s) for whom samples were submitted. Reproduction of this report must be in its entirety. Levels listed are guidelines only. Data was reported based on standard laboratory procedures and deviations.

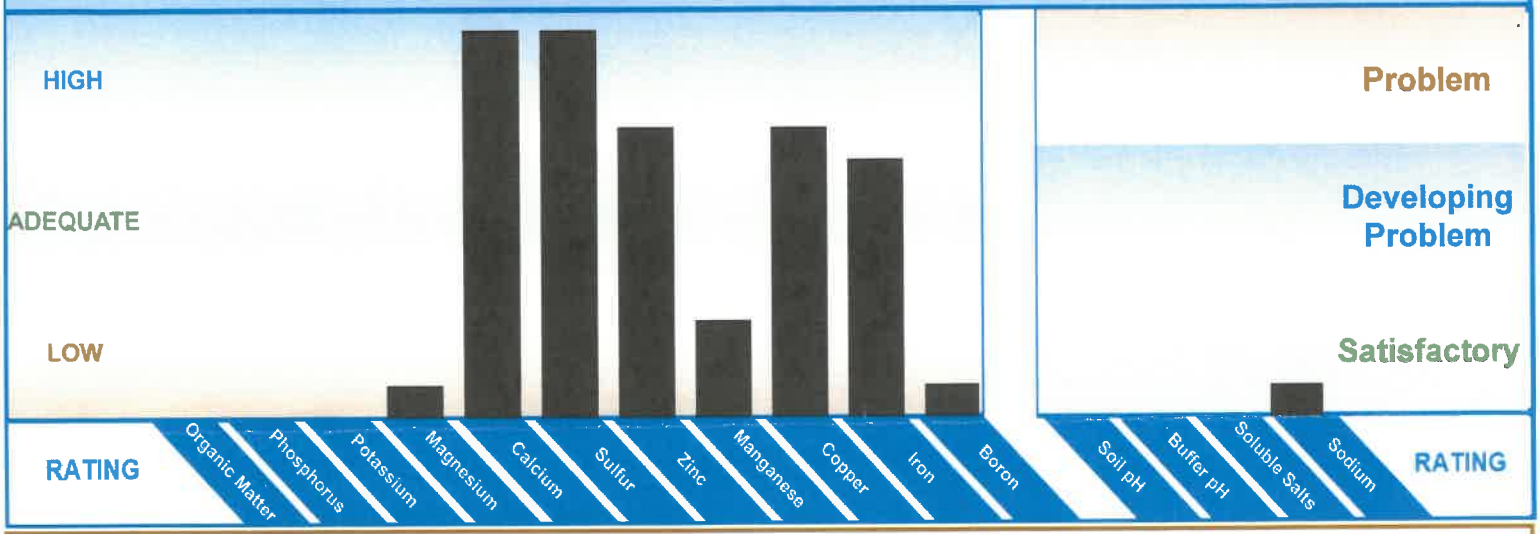
106 North Cecil Street, PO Box 7 • Bonduel, WI 54107 • P: 715.758.2178 • bonduel@agsource.com

LAWN & GARDEN SOIL RESULTS

Date Received: 8-Nov-2019
Date Reported: 12-Nov-2019
Information Sheet #: 738919

AgSource LABORATORIES

GRAPHIC SUMMARY OF WEIGHTED AVERAGE TEST RESULTS



SUMMARY OF SOIL FERTILITY AND PLANT NUTRIENT GUIDELINES

Sample Number	Crop Yield or Turf/Ornamental Code	Lime Lbs/1000ft2	PLANT FOOD NEED IN: Lbs/Acre N	P_2O_5	K_2O	Mg	S	Zn	Mn	Cu	Fe	B
1	Lawn											
Average	Lawn	----	----	----	----	----	----	----	----	----	----	----

Helpful Hints

A "0" application rate means that no additional lime or fertilizer is necessary at this time, based on the soil test results.

1 LB/ACRE = 0.02 LBS/1000 FT^2

1 LB/ACRE = 0.002 LBS/100 FT^2

*Note: 1 LB of actual Nitrogen is equal to 2.17 LBS Urea (46-0-0), 5.55 LBS Ammonium Phosphate (18-46-0) or 4.76 LBS Ammonium Sulfate (21-0-0-24S)

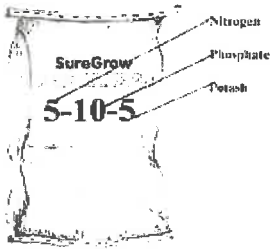
FERTILIZER LABELS & WHAT THEY MEAN

A fertilizer grade or analysis that appears on the bag is the percentages of nitrogen (N), phosphorus (P_2O_5) and potassium (K_2O) in the material. A 5-10-15 grade fertilizer contains 5 percent N, 10 percent P_2O_5 and 15 percent K_2O. A 50 pound bag of 5-10-15 fertilizer contains 2.5 pounds of N (50 x 0.05 = 2.5), 5 pounds of P_2O_5 (50 x 0.10 = 5), and 7.5 pounds of K_2O (50 x 0.15 = 7.5), for a total of 15 pounds of nutrients. The other 35 pounds of material in the bag is filler or carrier.

HOW MUCH PRODUCT TO USE

1. **Convert the lbs/acre recommendation** to lbs/1000 ft2 for smaller areas.
2. Multiply the nutrient recommendation times the square footage of your garden, then divide by 1000.
3. Take the value you get from #2 and divide by the percent analysis of the nutrient in the fertilizer you plan to use.

Example:
GARDEN AREA = 500 FT^2
NITROGEN REC = 40 LBS/ACRE
CONVERT TO LBS/1000 FT^2 = 0.8 LBS/1000 FT^2
AMOUNT OF ACTUAL N NEEDED: 0.8 X 500 ÷ 1000 = 0.4 LBS
FERTILIZER YOU MIGHT USE = 21-0-0 (AMMONIUM SULFATE) = 21% NITROGEN



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DIVISION OF AGRICULTURE
RESEARCH & EXTENSION
University of Arkansas System

Agriculture and Natural Resources

FSA2118

Understanding the Numbers on Your Soil Test Report

Leo Espinoza
Associate Professor and
Agronomist - Soils

Nathan Slaton
Professor,
Soil Testing

Morteza Mozaffari
Research Assistant
Professor, Soil Testing

A routine soil test provides an index describing the availability of nutrients for plant uptake. Routine soil tests measure only a portion of the total pool of nutrients in the soil. Soils have large amounts of most plant-essential nutrients, but only a small fraction (often less than 1%) are in a form that can be taken up by plants. The release of native soil nutrients and the "tie-up" of nutrients added from manures, fertilizers, compost and plant residues involve complex soil chemical, microbiological and physical processes.

In January 2006, a number of changes were implemented in the University of Arkansas soil testing and fertilizer recommendations program. The information presented in this fact sheet will help the reader understand the numbers in the soil test report.

Fertilization Philosophy

Due to variations in soil properties from one geographic region to another, soil testing laboratories may use different extractant solutions. Soil testing labs use these solutions to extract plant-available nutrients from soil and apply different philosophies to interpret the results and estimate the amount of nutrients required to optimize plant growth and yield potential. The University of Arkansas uses the Mehlich-3 soil test method and recommends fertilizer rates that optimize plant growth and yield and replace the macronutrients removed by the harvested portion of a crop. For some soils, additional fertilizer will be recommended to build or maintain the soil levels near a "Medium" range for P (phosphorus) and K (potassium). The amount of P and K needed to raise the soil test level to "Medium" may not be economically or agronomically practical in a single application or growing season, particularly for soils with very low nutrient levels. Therefore, the University of Arkansas' recommendations normally use an eight-year period to build nutrient-deficient soils to the "Medium" level. The recommendations assume that, on average, 15 lb P_2O_5/acre are required to raise the soil-test P level by 1 ppm (2 lb/acre), and 8 lb K_2O/acre are needed to raise the soil-test K level by 1 ppm. Fertilizer and lime recommendations are also based on crop rotations, soil texture, plant variety and yield goal when appropriate.

Nutrient Availability Index

The concentrations of soil nutrients appear in the ***Nutrient Availability Index*** section of the University of Arkansas soil test report and are reported with units of ppm (parts per million) and pounds per acre (lb/acre). One part per million equals approximately 2 pounds per acre (when the sample is taken from the top 6 inches). In addition to reporting the concentration of each nutrient, there is also an availability index or soil test level associated with the P (phosphorus), K (potassium) and Zn (zinc) concentrations. This level is related to the expected crop yield that would be produced without additional fertilization. A nominal fertilizer rate may be recommended for selected

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crops on soils with "Optimum" soil nutrient levels to compensate for nutrients removed by the harvested portion of the crop. Variables other than fertilization (e.g., water stress, insects, hardpans, etc.) can also affect yield potential, even if plants are properly fertilized. Table 1 shows the general interpretation of soil-nutrient concentrations and levels for most agronomic crops. Because plant species often have different nutrient requirements, the defined soil-nutrient concentrations that accompany the soil test levels are general in nature.

The interpretations provided in Table 1 apply only to routine tests conducted by the University of Arkansas soil testing laboratory and should not be used to interpret information provided by other laboratories. Contact your county Extension office for additional information or other publications.

Phosphorus (P) and Potassium (K)

Phosphorus and potassium are two of the three macronutrients (the other being nitrogen) required by plants for optimum growth. They are required in larger amounts compared to the micronutrients (e.g., zinc, iron, boron, etc.). Yield response to P fertilization is not likely when the soil P is ≥36 ppm (72 lb/acre) for row and forage crops, above 25 ppm (50 lb/acre) for fruit crops and above 75 ppm (150 lb/acre) for vegetable production. Responses to potassium fertilization are not likely when the soil tests above 175 ppm (350 lb/acre) for vegetables, row and forage crops and above 90 ppm (180 lb/acre) for fruit crops.

Calcium (Ca) and Magnesium (Mg)

Most sandy soils have calcium concentrations below 400 to 500 parts per million (800 to 1,000 lb/acre), while clayey soils usually test above 2,500 ppm. Normally, the higher the calcium level, the greater the soil clay content. Recent limestone applications may result in higher calcium levels. If the soil pH is maintained in the recommended range for the crop grown, calcium deficiency is very unlikely. In general, the higher the clay content, the more lime will be required to raise soil pH to the desired level.

Limited information is available on the crop response to magnesium fertilization in Arkansas, but if the soil tests below 31 ppm (62 lb/acre), the soil test report will suggest an application of magnesium. Most soils low in magnesium are often acidic and low in calcium.

Iron (Fe), Manganese (Mn), Copper (Cu), Zinc (Zn) and Boron (B)

The extractable levels of these micronutrients are printed on the soil test report; however, with the exception of zinc, their levels do not currently affect the fertilizer recommendations. Soil-test zinc levels below 4 ppm (8 lb/acre) coupled with pH above 6.0 may trigger a zinc fertilizer recommendation. Plant tissue and soil analyses should be used together to assess the need for application of the other micronutrients. A very high level of any micronutrient does not necessarily indicate that a plant nutrient toxicity will develop. For example, soil-test iron values above

TABLE 1. Interpretation of soil-nutrient concentration ranges and soil test levels of surface soil samples for most row crops and forages. The interpretation for vegetable crops and other plants may vary.

Soil Test Level	Expected Yield Potential†	Mehlich-3 Nutrient Concentrations								
		P	K [Most Crops]	K [Turf Codes]	Ca‡	Mg‡	SO_4-S‡	Mn‡	Cu‡	Zn
		mg/kg (or ppm)								
Very Low§	<65%	<16	<61	<21						<1.6
Low§	65 - 85%	16 - 25	61 - 90	21 - 40	≤400	≤30	≤10	<40	<1.0	1.6 - 3.0
Medium§	85 - 95%	26 - 35	91 - 130	41 - 60						3.1 - 4.0
Optimum	100%	36 - 50	131 - 175	61 - 100						4.0 - 8.0
Above Optimum (High)	100%	>50	>175	>100						>8.0

†Expected yield potential without fertilization.
‡Recommendations are not provided for these nutrients. The listed values represent general guidelines for interpretation.
§The soil test levels of "Very Low," "Low" and "Medium" are considered "Sub-Optimum" levels.

magnesium (Mg^{++}), potassium (K^{+}), sodium (Na^{+}), ammonium (NH_4^{+}), aluminum (Al^{+++}) and hydrogen (H^{+})]. Cation exchange capacity is expressed in units of centimoles per kilogram (cmol/kg). Soil CEC on the University of Arkansas soil test report is termed "estimated cation exchange capacity," or ECEC, because this property is calculated (rather than determined analytically) by summing the basic cation (Ca, Mg, Na and K) charges and estimating the acidic cation charges from soil pH. Soil ECEC is also an indication of soil texture and organic matter content. Generally, in Arkansas, sandy-textured soils have an ECEC <9 cmol/kg, loamy soils have an ECEC of 9 to 20 cmol/kg and clayey soils have an ECEC above 20 cmol/kg. Soil clay content, clay type and organic matter content influence the soil CEC. In general ECEC increases as the soil clay and/or organic matter content increase.

Organic Matter (O.M.)

Organic matter is no longer a routine test, but can be determined for a fee. Check with your county Extension office to determine the current fee. Soil organic matter content in Arkansas soils typically ranges from 0.5% to 5.0%. Soil organic matter contents <0.5% are low, and values >2.0% are desirable.

Estimated Soil Texture

The soil textural class designation for submitted soil samples was previously provided by the client. However, inconsistent and erroneous textural class designations often resulted in lime and nitrogen fertilizer recommendations that were not appropriate for the intended crop and soil properties. Therefore, the laboratory now estimates the soil textural class based on soil pH and soil-test calcium. While the relationship works well in most cases, continuous animal manure applications, recent liming and long-term application of alkaline well water can dramatically increase soil calcium and may lead to an erroneous estimate of soil textural class. Texture influences the recommended N and lime rates. Therefore, if the estimated soil texture is not correct, contact the county Extension agent.

Percent Base Saturation (% Base Saturation)

Base saturation represents the percentage of soil cation exchange sites occupied by the basic ions Ca, Mg, Na and K. The difference between this number and 100 is the percentage of cation exchange sites occupied by acidic cations: Al and H. Under most conditions, a relatively high base saturation (>60%) is desirable. Soil pH increases as percent base saturation increases, with base saturations of 70% to 80% representing soils having pH >6.0.

Sodium (Na) is not an essential element for plant growth, but is important for diagnosing problem soils that may contain high amounts of Na. In soils with high soil sodium levels, irrigation water may also be high in sodium or the soil may contain natural deposits of this element. Soil-test concentrations are not given, but are expressed as exchangeable Na percentage on the ECEC. When the estimated exchangeable sodium exceeds 15%, the soil is considered "sodic," but crop production problems may occur at lower levels. Exchangeable sodium percentages <5% usually cause few production problems.

Fertilizer and Lime Recommendations

The amount of fertilizer and lime recommended may be given in pounds per acre (lb/acre), pounds per 1,000 square feet (lb/1000 ft^2) or pounds per 100 feet of row (lb/100 ft row), depending on the crop selected. The ***Crop Notes*** section in the soil test report includes instructions on how and when to apply the recommended fertilizer. The notes apply only to the respective crop code (e.g., Crop 1 Notes apply only to Crop 1). Precautionary notes or recommendations for other nutrients may also appear in this section. The user is encouraged to obtain publication ***FSA2153, The Soil Test Report***, for further information.

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All of the authors are with the University of Arkansas Division of Agriculture. **DR. LEO ESPINOZA** is associate professor and agronomist - soils in Little Rock. **DR. NATHAN SLATON** is professor, soil testing, at the University of Arkansas in Fayetteville. **DR. MORTEZA MOZAFFARI** is research assistant professor, soil testing, Soil Testing and Research Laboratory in Marianna.

FSA2118-PD-1-12RV

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200 ppm (400 lb/acre) and zinc values above 40 ppm (80 lb/acre) are sometimes observed, but rarely are these concentrations toxic to plants. In contrast, manganese levels exceeding 200 ppm (400 lb/acre), coupled with a soil pH below 5.2, may result in manganese toxicity. This particular problem is easily corrected by applying recommended rates of lime to the soil. Soil-test Mn values <40 ppm (80 lb/acre) are considered low. Although Mn fertilizer is not currently recommended for agronomic crops in Arkansas, manganese deficiencies are sometimes observed on soil with pH >6.5 and soil-test Mn concentrations below 20 ppm (40 lb/acre) and may require application of Mn fertilizer.

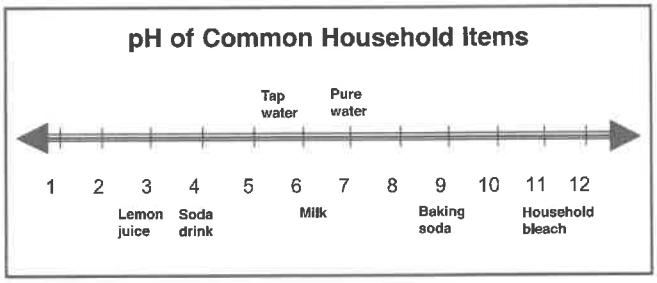
Nitrate-Nitrogen (NO_3-N) and Sulfate-Sulfur (SO_4-S)

Nitrogen is normally the most limiting nutrient for optimum plant growth. Soil tests that estimate soil N availability are not currently used because soil N exists in many forms which may change with time and influence plant availability. Soil nitrogen (N) and sulfur (S) are measured in nitrate-nitrogen (NO_3-N) and sulfate-sulfur (SO_4-S) forms. For most crops grown in Arkansas, nitrogen fertilizer recommendations are developed from research trials and are based on previous crop, soil texture, yield goal and sometimes cultivar. Analysis for soil nitrate-N, however, is done routinely only for a few selected crops, and it is used to refine their N-fertilizer recommendations. Soil samples can be analyzed for nitrate-N if requested for other crops, but fertilizer-N recommendations, particularly for lawns and forages, are not adjusted.

Sulfate-sulfur and nitrate-nitrogen can leach in sandy soils and typically accumulate above the dense or clayey soil horizons. For this reason, positive crop responses to sulfur fertilization are not common in clayey soils. As organic matter decomposes, sulfur and nitrogen are released into the soil solution. As a consequence of these complex reactions, the concentrations of these nutrients may vary considerably with time, environmental conditions and soil depth. Recommendations for sulfur fertilization are based on cropping history and, to some extent, on soil test level, especially for corn, cotton, wheat and forages.

pH or Soil Reaction

The soil reaction, or pH, is a measure of the acidity or alkalinity of the soil. A pH of 7.0 is neutral. Soil pH values below 7.0 are acid, while those above 7.0 are basic or alkaline. Each whole unit (e.g., 1.0) change in pH represents a ten-fold difference in acidity or alkalinity. For example, a pH of 5.2 is 10 times more acidic than a pH of 6.2. For most vegetable and row crops, a pH of 5.8 to 6.5 is optimal. A pH range of 5.5 to 5.8 is desirable for roses, turfgrasses, fruits and nuts. Certain shrubs and blueberries thrive in soils with a pH below 5.5. Most plants suffer visually when soil pH is below 4.8. Lime is recommended to neutralize soil acidity, with clayey soils requiring more lime than soils having a sandy or silty texture. Elemental sulfur (S) or aluminum sulfate (Al_2SO_4) is recommended to acidify the soil (lower the soil pH) for acid-loving plants. Soil pH values (measured in water) may vary by 1.0 pH unit or more during a growing season. In general, soil pH values are highest in the cool, wet winter months and lowest during the hot, dry summer months.



Salt Content (also referred to as electrical conductivity, or EC)

The electrical conductivity of a soil is used to measure the potential risk of salt injury to plants, and it is currently measured with a 1:2 soil:water mixture. This measurement includes all soluble salts, not just sodium chloride that most people are familiar with. Electrical conductivity readings can vary dramatically within fields and across time and are greatly affected by environmental conditions (e.g., rainfall). For this reason, soil EC is no longer measured on all routine soil samples, but is available (free of charge) by request. Measurement of soil EC can be useful when diagnosing crop growth problems, but has limited use in Arkansas for predicting fields that will experience salinity injury due to salt accumulation from hot, dry conditions, over-fertilization or salts deposited by irrigation water. Electrical conductivity values for soil samples collected during the winter months are commonly <100 µmhos/cm and are considered normal. Depending on the salt sensitivity of the plant species (rice, roses and strawberries are more sensitive than cotton or bermudagrass), salt injury symptoms may occur when EC values are >500 µmhos/cm.

Estimated Cation Exchange Capacity (ECEC)

Cation exchange capacity (CEC) refers to the ability of negatively charged soil particles to attract and retain positively charged ions [calcium (Ca^{++}),

Item #18

Demographics / Class A Motorcoach Industry

The development will be marketing to a national audience. As can be seen by the following information, the buyer will be in their mid-50's to mid-70's with a high income level and high net-worth.

BY SCOTT STROPKAI

STATISTICALLY SPEAKING

Mining Consumer Data: Class A Motorhomes

Not surprisingly, the Class A ownership leans toward an older crowd; Class A coaches are, by segment, the most expensive RVs in the industry and most owners tend to have established careers in place to pay for them.

If you were with us last issue, you perhaps recall our introduction to a series of charts that outlined the basic owner of a fifth-wheel: income range, ethnicity, age range and gender.

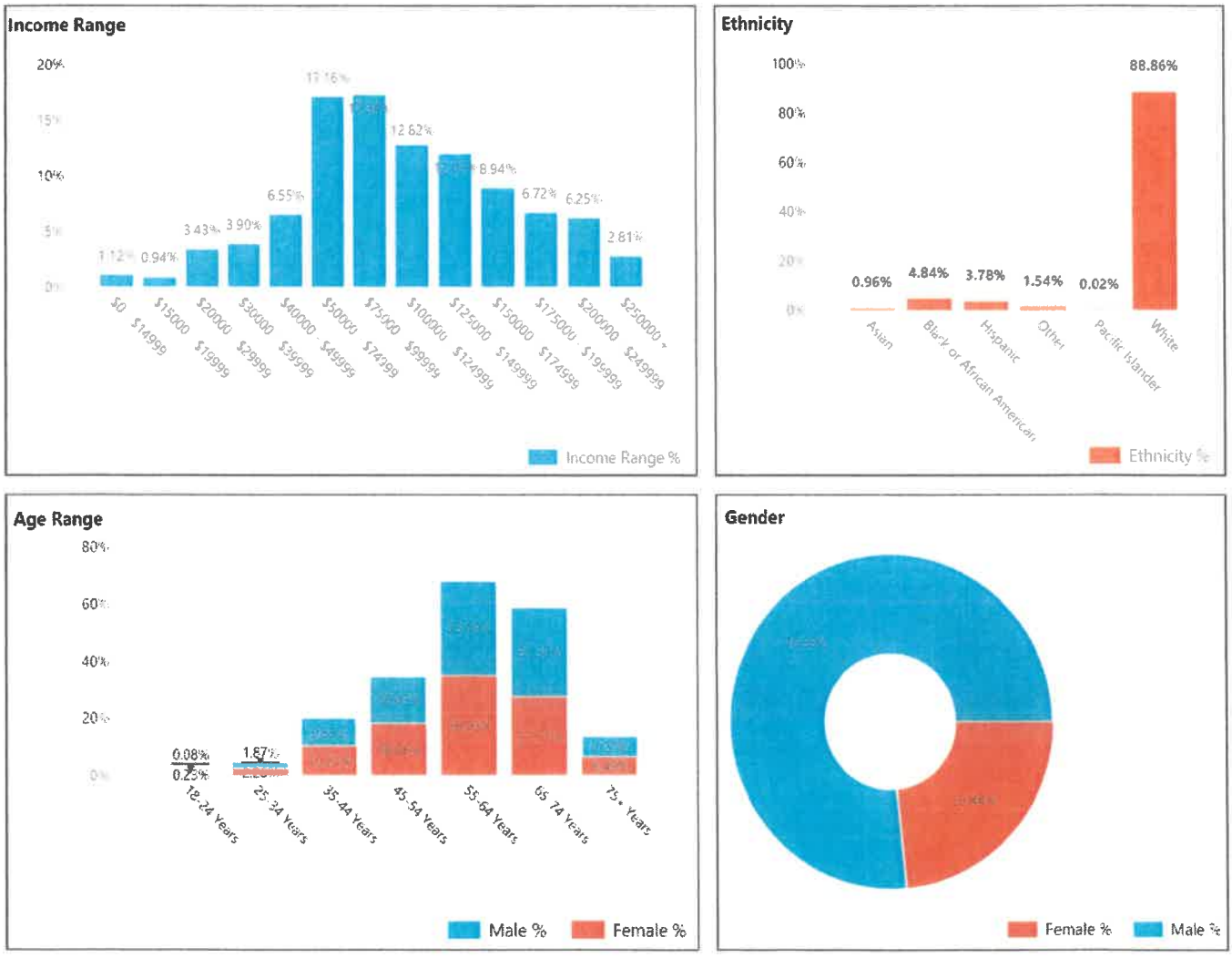
The purpose was to provide a snapshot into the typical buyer of that style of towable.

This issue, we're going to take a look at buyers of Class A motorhomes — again, by mining data in tandem with our partners at HIS Inc.

Not surprisingly, the Class A ownership leans toward an older crowd; Class A coaches are, by segment, the most expensive RVs in the industry and most owners tend to have established careers in place to pay for them.

Enjoy this snapshot into Class A ownership. We'll be back next issue with a new segment.

Class A 12MR Demographic Data as of April 2019



Scott Stropkai is general manager of Statistical Surveys, a well-known statistical and consulting firm in Grand Rapids, Mich. Statistical Surveys tracks retail RV sales nationwide in all 50 states and Canada, producing market share information (available by subscription) for manufacturer, model, state, basic training area (BTA), county, city, zip code and dealer.

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HOMES

Touring America in an RV That's Basically a Five-Star Hotel

Affluent and adventurous retirees (and soon-to-be retirees) hit the road in Class A motorhomes with plenty of comforts—and a fuel bill that rivals a small mortgage

By Beth DeCarbo
Oct. 11, 2018 10:45 a.m. ET

Diehard Auburn football fans Rick and Susan Turner hold season tickets on the 35-yard line at the university's Jordan-Hare Stadium. But when the Tigers are on the field, the Turners are in the parking lot.

Every home game, the Birmingham, Ala., couple tailgates from their 45-foot 2016 Tiffin Zephyr, a luxury motorhome. The Zephyr offers an entertainment center and a full kitchen with solid-surface countertops and stainless-steel sink, as well as a range, microwave, dishwasher and refrigerator. And unlike the stadium, there's no line to use the Zephyr's bathroom. Most important, electrical hookups and an automatic generator ensure that the motorhome is fully air-conditioned.

"It's hot in Alabama in September," says Mr. Turner, 64, senior vice president of Greenbrier Rail Services, a company that makes freight railcars and equipment.

When the Turners hit the road—which is quite often—they travel with all the luxuries of a five-star hotel. In the world of motorhomes, Class A models that measure 40 to 45 feet are among the most lavish. New, fully loaded Class As off the lot start at about $250,000, and customized coaches can reach $3 million. Because of the price, Class A buyers are typically retirees or those

Doug and Dani Stiebeling's Itasca Ellipse motorhome, on the right, at their lot at Hearthside Grove in Petoskey, Mich. TONY DEMIN FOR THE WALL STREET JOURNAL

1 of 20

MORE FROM MANSION

Inside the Mansion Retirement Issue

- Unraveling Mark Zuckerberg's Secret Deal for a $59 Million Tahoe Compound May 2, 2019
- In the Heart of Washington's Cascades, a Compound for Outdoor Enthusiasts May 2, 2019
- Private Libraries That Inspire **April 25, 2019**

nearing the end of their careers.

Mr. Turner, who paid about $525,000 for his Tiffin, retired once, but returned to the Portland, Ore.-based company at the request of the CEO. When he travels for work, he likes to take the RV, and his wife Susan, 63, and Labrador retriever Buddy typically come along for the ride. But they take plenty of personal trips to visit friends and extended family, as well as motoring to New Orleans for Mardi Gras and to the Florida Keys. In all, they put 10,000 to 15,000 miles on their motorhome each year.

Getting there isn't cheap—most Class As get roughly 8 miles per gallon in good conditions. "If you have to worry about MPGs, don't get an RV," Mr. Turner says. "You're spending $300 to $400 every tank of gas. It's a small mortgage for some people."

Mr. Turner plans to retire full time in a few years. The couple—he was 15 and she was 13 when hey started dating—hopes to spend six to eight months taking their RV up the West Coast from Southern California, across the country to northern Maine, then down the East Coast back to Birmingham.

Alabamans Susan and Rick Turner inside their 45-foot-long Tiffin Zephyr. PHOTO: CALEB CHANCEY FOR THE WALL STREET JOURNAL

Recent retirees Doug and Dani Stiebeling found their happy place in Petoskey, Mich. The couple's full time home is in Orlando, Fla., but they wanted a summertime destination to escape the Florida heat. In June they paid $250,000 for a 42-foot 2014 Itasca Ellipse, and drove it to Hearthside Grove, a luxury motorhome resort in Petoskey exclusively for Class A models. Their wooded lot, purchased in "the $250,000 range" measures one-fifth of an acre and includes a paved driveway with electrical, water and sewer hookups. Like many of the lots at Hearthside, the Stiebelings also have a 200-square-foot bungalow on their property where guests can stay when they visit.

The Stiebelings, along with their dog Pumpkin and cat Sammi, make Hearthside Grove their home base for much of the season, which runs from mid-May to mid-October. They hitch a car to the back of their motorhome to use for trips to the grocery store and other errands.

"There is so much to do in northern Michigan," says Mr. Stiebeling, 65, who retired in April after a 35-year career selling medical devices and artificial skin to burn centers. "The water is so clean, and there's trout fishing, golfing, restaurants galore—and not the typical chain restaurants. They're ma-and-pa places."

If they ever decide to take longer trips, they can put their Hearthside lot in the rental pool, allowing other Class A owners to lease their space and bungalow for $100 to $175 a night. Leasing their lot won't necessarily keep the fuel tank filled, but it could defray the property

taxes and insurance on their lot, as well as a rental fees to store their motorhome when not in use.

The Stiebelings put about 6,000 miles on their Itasca each year but plan to take longer trips down the road. They recently stopped at Gettysburg National Military Park in Pennsylvania, where they stayed at a campground. But many national parks limit RVs of this size. (Look for parks and campgrounds that say "big-rig accessible.") And wherever they go, Mr. Stiebeling does the driving. "She has driven it, but it makes her palms sweat a little bit," he says of his wife, Dani, who is 58.

Living in such close quarters could lead to domestic squabbles, but the Stiebelings' RV has three "slides" that can increase the floor space to almost 400 square feet when they're expanded, giving them their own space.

If anything, the RV life allows couples to spend quality time together and share experiences on the road. "We enjoy going places and seeing things together," says Mr. Turner. "I'm 64. I want to maximize the time I have with my wife."

Spending time with his wife, Linda, was one of the main reasons Nicholas Grimaldi purchased his 45-foot 2017 Entegra Anthem.

The Grimaldis live in Port Jefferson Station, N.Y., and are retired from the family's canvas and upholstery business. Mr. Grimaldi, 64, also works for an insurance company in claims, and he had Wi-Fi installed in his RV so he could work while on the road.

Take a 3D tour of a motor home

But the real driver behind the decision to buy is Linda Grimaldi's bucket list of destinations—the Grand Canyon, Mount Rushmore and Minnesota to see the aurora borealis. "Because of my wife's medical condition, she can't fly. She has a hard time breathing," he said. In the RV with portable oxygen, "we can go out and not skip a beat."

Mr. Grimaldi says a "great deal" made a Class A motorhome possible. This summer, he paid $302,000 for an unsold 2017 model with an original sticker price of over $500,000.

"It's all about timing in life. I always wanted to buy one. I never thought I'd be able to swing it," he says. "Never give up. If I can do it, anyone can."

Resorts for Motorcoaches

When they're not on the road, many Class A motorhome owners camp at luxury resorts that offer basic hookups, lavish amenities and an active social calendar. Here's a sampling of three resorts exclusively for Class A owner:

Las Vegas Motorcoach Resort

Las Vegas

Lots: 407 total, with 41 currently on the resale market

Price range: $88,000 for an unimproved lot, to $379,000 for lots with 'palapas,' shelters typically with kitchens and entertaining spaces

Amenities: Clubhouse, pool, tennis/pickleball, fitness center, putting green

Social scene: Monthly movie parties as well as scavenger hunts, poker parties, barbecues.

Desert Shores Resort

Indio, Calif.

Lots: 141 total, with on the resale market

Price range: $300,000 to $600,000. Every lot includes a villa, a 1,200- to 1,800-square-foot structure with a great room, kitchenette and bathroom.

Amenities: Dog park, clubhouse, pool, fitness center; financing through Wells Fargo .

Social scene: Dancing, Jeep excursions and an annual 'Casita Crawl,' in which some owners serve cocktails to other members.

Hearthside Grove Motorcoach Resort

Petoskey, Mich.

Lots: 165 total with another 17 under construction; 45 lots currently listed

WHO'S BUYING RVS?

Consumers between 55 and 74 years old are the "sweet spot" for the RV industry, and manufacturers are already seeing a baby-boomer bump in sales.

A record 504,600 recreational vehicles were shipped to dealerships last year, a 17.2% increase from 2016. And shipments this year are expected to reach 539,900, according to the RV Industry Association, a Reston, Va.-based trade group that represents manufacturers of motorhomes, towable trailers, fifth wheels and other recreational vehicles.

Most people buy RVs for the convenience and flexibility. "People can go when they want, where they want," says Phil Ingrassia, president of the RV Dealers Association, another trade group, based in Fairfax, Va. "They've got their stuff with them—whether it's golf or fishing. When we do surveys, we find that traveling with pets is a big motivation."

Class As represent a smaller segment of the overall market in terms of volume, with just over 62,000 units shipped last year, Mr. Ingrassia adds.

With six dealerships in the U.S., Lazydays RV is the country's top seller of Class A diesel motorhomes, says Bill Murnane, chairman and CEO of the Lazydays. Its main location just east of Tampa sits on 126 acres, with 1,500 to 2,000 RVs on the lot at any given time.

Class A buyers are often retired snowbirds who have a house in the North. "They'll hop in the RV and tow their car and travel south to one or multiple campsites they've reserved. Many times they'll travel in groups," Mr. Murnane says.

Most buyers select their RV from what's available on the lot, but Class A purchasers increasingly want custom features on their motorhomes, says Ryan Roske, Class A-diesel product manager for Winnebago Industries, based in Forest City, Iowa. "There's been a shift in interest in owners wanting to really make the motorcoach their own," says Mr. Roske, noting that Winnebago has a customization division. Custom touches include specialty shelving in the wardrobe, an office suite instead of a dinette, and storage space converted into kennels to house pets.

With all those upgrades, some Class A owners make their motorhome their primary residence, says Brion Brady, general manager of Entegra Coach, a brand made by Middlebury, Ind.-based Jayco. Roughly 60% of Entegra buyers are on the road traveling six to eight months of the year, Mr. Brady estimates.

"This is for the older buyer that doesn't want to sit still or just golf every day," he adds. "They want to experience everything. And they want to take 'home' with them. It's your

pillow, your sheets, your refrigerator, your shower.

Price Range: $99,000 to $923,000 for lots with bungalows, outdoor entertaining space and water/fire features

Amenities: Clubhouse, pool, theater, tennis/pickleball court, fitness center, business center, laundry facilities.

Social life: Cooking classes, billiards tournaments, movie screenings, and manufacturer-motorcoach parties

Write to Beth DeCarbo at beth.decarbo@wsj.com

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Why America's RV market is booming

Melody Hahm
Senior Writer

Yahoo Finance March 24, 2017

Lennar's Heritage community
More

The RV market is on a tear — thanks to retiring baby boomers.

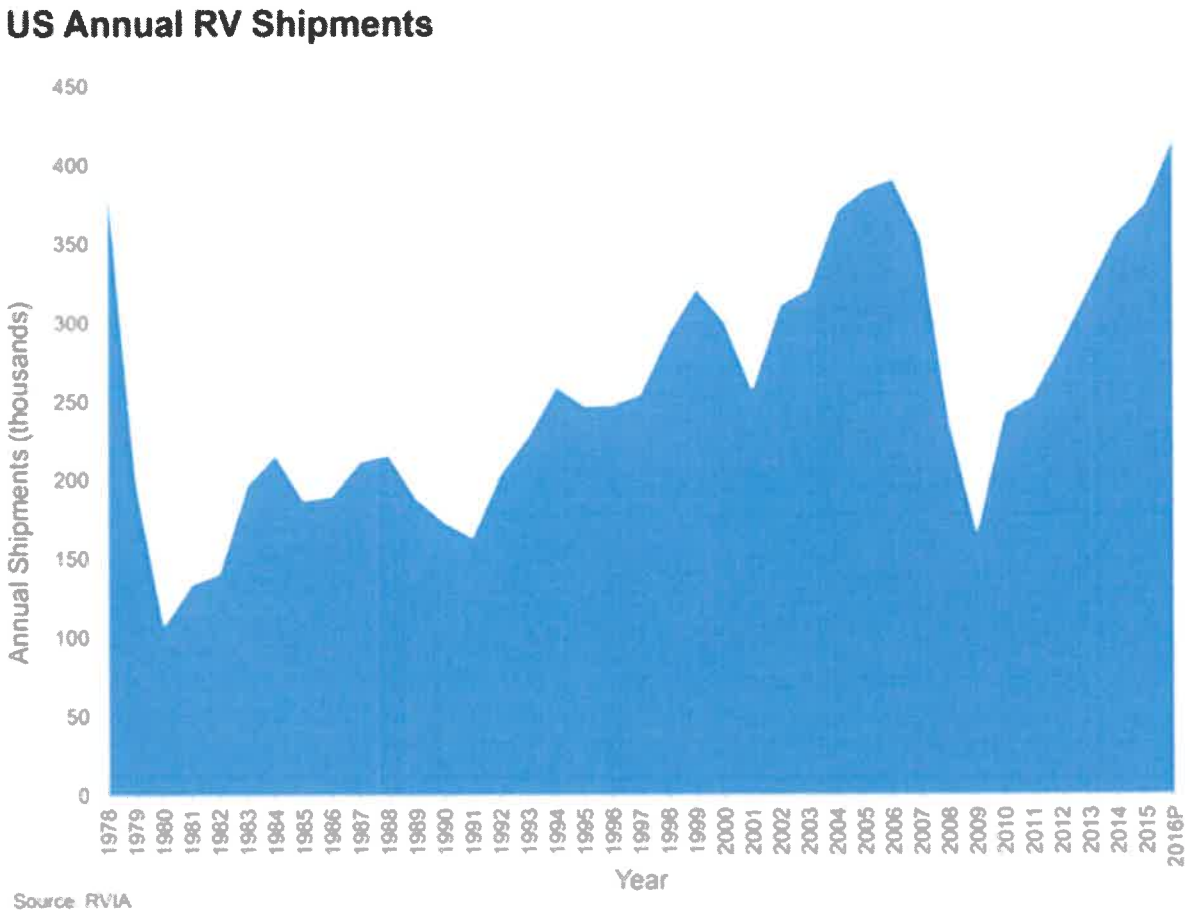
And it's a good signal for health of the American consumer, given the most important factor in determining the demand for recreational vehicles is real per capita net worth, according to a note this week from Wells Fargo senior economist Eugenio J. Alemán.

"As Baby Boomers continue to retire en masse, the demand for RVs is expected to continue to increase, especially if real per capita net worth continues to improve and the prices of

homes, which seem to be helping households buy RVs since the end of the Great Recession, continue to appreciate," Alemán writes.

In fact, the demand for RVs is insatiable: RV shipments reached 430,961 total units in 2016, a 15.1% increase over 2015 — and the best annual total in 40 years, according to the Recreational Vehicle Industry Association (RVIA). We haven't seen these levels since the late 1970s. Currently, there are about 9 million RVs on the road in the US, and an estimated 8% to 9% of all US households now own an RV.

After RV shipments dropped to a 30-year low in the downturn of the late 2000s, demand is stronger than ever, says Pete Reeb, principal at California-based John Burns Real Estate Consulting.



Source: RVIA
More

America's RV boom is a hot opportunity for real estate developers

Real estate developers and homebuilders are even catering to the needs of RV owners. In hot retirement markets across states like Nevada, Arizona and Florida, developers are

seizing the opportunity to accommodate the increasingly mainstream audience of RV aficionados.

Take, for example, Valencia Lakes, a community for "active adults" where at least 80% of the community must be over the age of 55. The community, developed by GL homes, has built a 48-space parking lot on its property to cater to RV owners.

Marisa Lufkin, a project manager for Valencia Lakes, said her team revisited its original building masterplan after recognizing a close competitor offered communal storage for boats and RVs. Instead of building two recreational centers, as it had originally planned, GL Homes used the second, smaller space to develop a softball field, a veterans' circle of honor and an RV parking lot. There are only 48 spaces for roughly 1,631 homes and there's currently a waiting list to reserve a space, which leases for $65 per month.

Aerial view of Valencia Lakes
More
Lufkin says members of Valencia Lakes originally hail from all parts of the US and are seeking a mobile lifestyle. "Our residents are choosing to be on the road a couple months out of the year but aren't sacrificing having a home," she said.

Meanwhile, Heritage, an adult community in Henderson, Nevada, offers homes that include an RV garage, which is at least 15% bigger than the standard. There is about a $25,000 premium for a home with an RV garage plan. Lufkin says GL Homes is not planning to emulate this strategy but will take into account the insatiable demand for RV accommodations as it builds out future projects.

“RVs are certainly a discretionary purchase. Everybody needs shelter, but very few people need an RV,” Reeb says.

As baby boomers retire in droves…

If few people need RVs, then why are so many people suddenly buying them? One possible explanation for increased appetite in owning an RV is the changing way people are retiring, according to Reeb.

“With the rise of house and apartment rental websites like Airbnb and VRBO, suddenly baby boomers have access to way more vacation properties than you’ve ever had in the past. Instead of buying a second home somewhere and being locked in, you have the option of being mobile,” he says.

RVs MOVE AMERICA

ECONOMIC IMPACT OF THE RV INDUSTRY

Wisconsin

569
# of RV BUSINESSES

94
# of RV DEALERSHIPS

$91.4 Million
TOTAL TAXES PAID
by RV Industry

TOTAL DIRECT ECONOMIC OUTPUT

$474.4 Million

RV Manufacturers and Suppliers	RV Sales and Service	RV Campgrounds and Travel
$228.5 Million	**$89.6 Million**	**$156.2 Million**

$139.9 Million
DIRECT WAGES

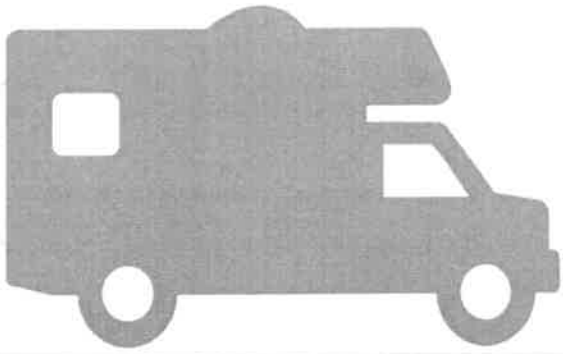
RV Manufacturers and Suppliers
$37.4 Million
RV Sales and Service
$41.6 Million
RV Campgrounds and Travel
$60.9 Million

3,179
DIRECT JOBS

RV Manufacturers and Suppliers
542
RV Sales and Service
777
RV Campgrounds and Travel
1,860

OVERALL INDUSTRY IMPACT

$876.5M	$268.9M	5,626
Total Economic Output	Total Wages	Total Jobs



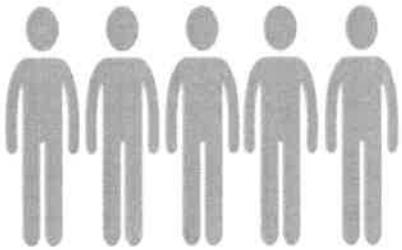
RVs MOVE AMERICA

ECONOMIC IMPACT OF RV MANUFACTURERS & SUPPLIERS

Wisconsin

11,641
# of RV SHIPMENTS
to Wisconsin

TOTAL DIRECT ECONOMIC OUTPUT
$228.5 million



542
DIRECT JOBS

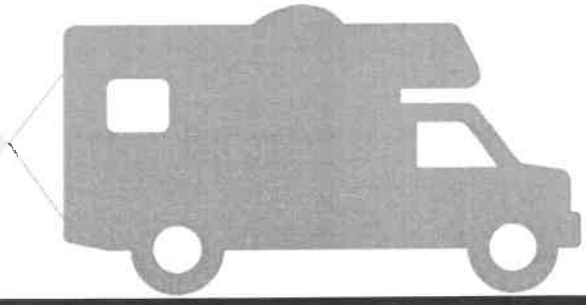
$37.4 Million
DIRECT WAGES

$366.6 Million
RETAIL VALUE OF RV SHIPMENTS
to Wisconsin

$4.7 Million
TOTAL TAXES PAID
by RV Manufacturers and Suppliers

4
# of RV MANUFACTURER PLANTS

OVERALL MANUFACTURER & SUPPLIER IMPACT
$344.3 Million



RVIA

www.rvsmoveamerica.org
Published 2017

RVs MOVE AMERICA

ECONOMIC IMPACT OF THE RV INDUSTRY

Wisconsin

Direct Economic Impact	Jobs	Wages	Output
RV Manufacturers and Suppliers	542	$37,380,200	$228,521,800
RV Sales and Service	777	$41,565,600	$89,634,100
RV Campgrounds and Travel	1,860	$60,922,800	$156,234,500
Total	**3,179**	**$139,868,600**	**$474,390,400**

Indirect Impact	Jobs	Wages	Output
Agriculture	25	$729,700	$2,553,900
Mining	2	$133,400	$581,500
Construction	47	$3,000,900	$6,629,000
Manufacturing	78	$5,744,200	$29,079,700
Wholesale	31	$2,618,900	$6,482,000
Retail	9	$345,300	$665,800
Transportation & Communication	113	$8,454,900	$29,747,300
Finance, Insurance & Real Estate	158	$8,295,200	$37,139,200
Business & Personal. Services	477	$27,006,000	$49,944,000
Travel & Entertainment	99	$2,100,900	$6,094,600
Government	32	$2,582,600	$4,309,100
Other	0	$0	$0
Total	**1,071**	**$61,012,000**	**$173,226,100**

Induced Economic Impact	Jobs	Wages	Output
Agriculture	46	$2,003,300	$5,355,800
Mining	1	$57,700	$334,100
Construction	12	$752,200	$2,129,000
Manufacturing	122	$9,109,800	$67,599,400
Wholesale	50	$4,019,800	$10,099,600
Retail	217	$6,939,100	$14,527,700
Transportation & Communication	65	$4,809,600	$17,238,600
Finance, Insurance & Real Estate	159	$7,870,900	$48,552,300
Business & Personal Services	499	$27,486,400	$50,399,400
Travel & Entertainment	170	$3,607,800	$9,854,500
Government	17	$1,169,300	$2,212,500
Other	18	$204,000	$627,900
Total	**1,376**	**$68,029,900**	**$228,930,800**

	Jobs	Wages	Output
Total Economic Impact	**5,626**	**$268,910,500**	**$876,547,300**

Tax Impact	Federal Taxes	State Taxes	Total Taxes
Business Taxes	**$51,159,100**	**$40,240,300**	**$91,399,400**

Wisconsin Act 67

Passed in 2017, Act 67 limits the discretion and flexibility of counties, with respect to CUPs. A recent summary of Act 67 by Door County Corporation Counsel, Grant Thomas, states, "If an applicant for a conditional use permit meets or agrees to meet all of the requirements and conditions specified in the county ordinance or those imposed by the county zoning board, the county shall grant the conditional use permit. Any condition imposed must be related to the purpose of the ordinance and be based on substantial evidence." He goes on to say, "the requirements of the conditions must be reasonable and, to the extent practicable, measurable." It also states, "the county's decision to approve or deny the permit must be supported by substantial evidence". While this puts the initial responsibility on the developers to provide scientific, measurable, and relevant methods to address the conditions, it also requires the opposition's rebuttals to take the same format. "Not in my backyard" and other subjective arguments are no longer enough to prevent a CUP from being issued. As stated in Act 67, "...facts and information, other than merely personal preference or speculation..." must be presented.

Larkin Hoffman ATTORNEYS
est. 1958

Minneapolis Office
8300 Norman Center Drive
Suite 1000
Minneapolis, MN 55437-1060

Rochester Office
421 First Avenue
Suite 300E
Rochester, MN 55902

Articles & Resources

Wisconsin's Act 67 Could be a Game-Changer For Conditional Use Permit Applicants

04/23/2018 / Gary Van Cleve

The conditional use permitting process received a significant overhaul by the Wisconsin Legislature last year in ways that should be welcomed by property owners seeking such permits. Wisconsin Act 67 (Act 67), effective Nov. 28, 2017, mandates that a conditional use permit (CUP) sought from any local zoning authority – be it county, city, village or town – must issue where the applicant meets or agrees to meet standards specified in a local ordinance. The new law also requires "substantial evidence" in the record to support a denial of the CUP and specifies that the "personal preference" or "speculation" of a person opposed to the CUP is not substantial evidence. The overall impact of Act 67 will be to impose more measurable standards upon local government decision making to ensure the exercise of reasonable discretion in granting or denying CUPs.

Before Act 67 was adopted, Wisconsin's statutes included no definition of a CUP, stated no standards for substantial evidence sufficient to support denial of a CUP and provided no right of an applicant to receive a CUP if all local standards were met.

Act 67 defines "conditional use" as "a use allowed under a conditional use permit, special exception, or other special zoning permission issued by a [local zoning authority], but does not include a variance." "Substantial evidence" under the law "means facts and information, other than merely personal preferences or speculation, directly pertaining to the requirements and conditions an applicant must meet to obtain a conditional use permit and that reasonable persons would accept in support of a conclusion." Additionally, there is now a statutory right for the applicant to receive the CUP, "If an applicant … meets or agrees to meet all of the requirements and conditions specified in the … ordinance or those imposed by the [zoning authority] …" Under these circumstances, the law directs that the zoning authority "shall grant the conditional use permit."

Further guidance in Act 67 directs that conditions imposed by the zoning authority "must be reasonable and, to the extent practicable, measurable and may include conditions such as the permit's duration, transfer, or renewal."

The new CUP standards codified in Act 67 provide new potential bases for judicially challenging the denial of a CUP in Wisconsin. For example:

- If the record shows that the applicant is able to meet or agrees to meet all requirements and standards, but is denied the CUP, a challenge would likely be successful.
- If a CUP denial is based on public comments in opposition to the permit that express nothing more than the personal opinions or preferences of the opponents or speculation about negative consequences of the proposed use, then a challenge would likely be successful.
- If a CUP is denied based on a general finding that the proposed use is contrary to the public welfare, then the denial would be susceptible to a challenge that the finding is vague and unreasonable, given that the law in Wisconsin now requires "reasonable and … measurable" conditions and further requires facts and information "directly pertaining to the requirements and conditions an applicant must meet …"

Wisconsin's new CUP law is sure to spawn new judicial challenges and it will be interesting to see how Wisconsin's courts interpret and apply the new law when faced with a challenge to a CUP denial.

Note: The provisions of Act 67 are codified in Wis. Stat. § 59.69(5e) for counties, Wis. Stat. § 62.23(7)(de) for cities and villages, and Wis. Stat. § 60.61(4e) for towns.

CONDITIONAL USE (SPECIAL EXCEPTION) PERMITS - POST 2017 WISCONSIN ACT 67

-and-

2017 WISCONSIN ACT 68 - FREEZE OF REGULATIONS UPON INITIAL APPLICATION

Grant P. Thomas
Door County Corporation Counsel

I. *2017 Wisconsin Act 67*

A. History
   1. Enacted: 11-27-2017; Published: 11-28-2017; and Effective: 11-29-2017
   2. *2017 Wisconsin Act 67* was prompted (at least in part) by the Wisconsin Supreme Court's decision in *AllEnergy Corp. v. Trempealeau County Environment & Land Use Committee* 2017 WI 52 (May 31, 2017). It is fair to state that *2017 Wisconsin Act 67* reflects the dissent ... and is intended to limit the discretion and flexibility of counties with respect to CUP's.

B. Relevant Statutory Revisions
   1. Among other things, *2017 Wisconsin Act 67* created *Section 59.69(5e), Wisconsin Statutes*, which reads as follows:

(5e) CONDITIONAL USE PERMITS.

(a) In this subsection:

1. "Conditional use" means a use allowed under a conditional use permit, special exception, or other special zoning permission issued by a county, but does not include a variance.

2. "Substantial evidence" means facts and information, other than merely personal preferences or speculation, directly pertaining to the requirements and conditions an applicant must meet to obtain a conditional use permit and that reasonable persons would accept in support of a conclusion.

(b)

1. If an applicant for a conditional use permit meets or agrees to meet all of the requirements and conditions specified in the county ordinance or those imposed by the county zoning board, the county shall grant the conditional use permit. Any condition imposed must be related to the purpose of the ordinance and be based on substantial evidence.

2. The requirements and conditions described under subd. 1. must be reasonable and, to the extent practicable, measurable and may include

conditions such as the permit's duration, transfer, or renewal. The applicant must demonstrate that the application and all requirements and conditions established by the county relating to the conditional use are or shall be satisfied, both of which must be supported by substantial evidence. The county's decision to approve or deny the permit must be supported by substantial evidence.

(c) Upon receipt of a conditional use permit application, and following publication in the county of a class 2 notice under ch. 985, the county shall hold a public hearing on the application.

(d) Once granted, a conditional use permit shall remain in effect as long as the conditions upon which the permit was issued are followed, but the county may impose conditions such as the permit's duration, transfer, or renewal, in addition to any other conditions specified in the zoning ordinance or by the county zoning board.

(e) If a county denies a person's conditional use permit application, the person may appeal the decision to the circuit court under the procedures contained in s. 59.694 (10).

C. Matters to Consider

1. Quantum of Proof
   a) The quantum of proof necessary is "substantial evidence".
   b) "Substantial evidence" is defined as *"... facts and information, other than merely personal preferences or speculation, directly pertaining to the requirements and conditions an applicant must meet to obtain a conditional use permit and that reasonable persons would accept in support of a conclusion." (Section 59.69(5e)(a)2, Wisconsin Statutes)*
2. Burden of Proof
   a) The burden of proof (which includes the burden of production and burden of persuasion) is (at least initially) on the applicant. *Section 59.69(5e)(b)2, Wisconsin Statutes* provides that *"... the applicant must demonstrate that the application and all requirements and conditions established by the county relating to the conditional use are or shall be satisfied, both of which must be supported by substantial evidence."*
   b) The risk of non-persuasion remains on the applicant...starting with the application and continuing through the hearing.
   c) The burden of proof and risk of non-persuasion *may* shift to an opponent *if* the applicant produces enough evidence to prove a particular fact or issue.

3. County's Obligations
   a) *"If an applicant for a conditional use permit meets or agrees to meet all of the requirements and conditions specified in the county ordinance or those imposed by the county zoning board, the county shall grant the conditional use permit. "(Section 59.69(5e)(b)1, Wisconsin Statutes)*
   b) *"The county's decision to approve or deny the permit must be supported by substantial evidence." (Section 59.69(5e)(b)2, Wisconsin Statutes)*
   c) *"Any condition imposed must be related to the purpose of the ordinance and be based on substantial evidence." (Section 59.69(5e)(b)1, Wisconsin Statutes)*
   d) The requirements and conditions specified in the ordinance and/or imposed "*...must be reasonable and, to the extent practicable, measurable and may include conditions such as the permit's duration, transfer, or renewal." (Section 59.69(5e)(b)2, Wisconsin Statutes)*

2017 Wisconsin Act 67 seems to be pushing counties away from goal-directed requirements and conditions ... and toward prescriptive requirements and conditions. Not necessarily good development.

D. To Do's / Best Practices / Strategies
   1. Review and amend zoning ordinance(s) to ensure compliance with statutory changes arising from *2017 Wisconsin Act 67*
   2. Sift and winnow the conditional uses that have (likely) 'crept' into zoning ordinance(s).
      a) These conditional uses may be eliminated from particular zoning districts or altogether, changed to a permitted use subject to standards (e.g., performance standards), or classified as prohibited uses.
      b) But ... keep in mind the Wisconsin Court of Appeals decision in *Hussein v. Village of Germantown Board of Zoning Appeals 2011 WI App 96, 334 Wis. 2d 764,800 N.W.2d 551 (May 25, 2011)*. The Village amended its zoning code to remove the conditional use that was the basis for the CUP from the zoning district at issue. The court ruled that the previously granted CUP was void, the property owner was left with a legal nonconforming use, and the Village could not enforce the strictures of the CUP against the property owner. Consequently, the property owner could continue to sell cars in accordance with the historical use of the property, but if the use were to go beyond the historical use of the property, the Village could seek to eliminate the property's status as a legal nonconforming use.
   3. Graft as many requirements and conditions in to the zoning ordinance as is feasible ... with a legislative determination that such satisfy *Section 59.69(5e)(b)1&2, Wisconsin Statutes*.

4. Create two categories of requirements and conditions. Those that are generally applicable to conditional uses and those that apply to a particular conditional use.
5. Describe what constitutes "substantial evidence" in context of the requirements and conditions. For example:
    a) If "community character" is an issue … the American Planning Association has published useful guidance as to defining and measuring community character. Incorporate these into your zoning ordinances.
    b) If "traffic safety" is an issue … specify what type of traffic data collection and analysis will meet the "substantial evidence" threshold.
6. Review and revise CUP processes and procedures.
7. Review and revise CUP forms (e.g., informational materials, application, transmittal letters, town input form, public hearing notice, staff report, decision checklist, and decision documents).
8. Education and training of county (zoning and planning) staff.
9. Education and training of zoning committee and board of adjustment.
10. Corporation Counsel's attendance at zoning committee and board of adjustment meetings until they get comfortable processing (hearing and deciding) CUPs under the new law.
11. Outreach and education for town boards and plan commissions (who provide input on county CUP hearings) and development community members (attorneys, architects, builders, etc.).
12. Educating individual applicants as to process and requirements.
13. Staff role as gatekeepers.
    a) Critically review CUP applications.
    b) If lack "substantial evidence", deem CUP application incomplete and reject.
14. Paradigm shift regarding zoning committees and boards of adjustment
    a) "Substantial evidence" permeates CUP processes and procedures.
    b) Must understand that the level of public support or opposition for the proposed use, which used to be leveraged in these proceeding, matters not a whit if the support or opposition is not backed by "substantial evidence".
    c) Should review the evidence at the close of the applicant's case, and be willing to deny the CUP for failure of the applicant to meet its burden of proof.

WISCONSIN LEGISLATIVE COUNCIL
ACT MEMO

2017 Wisconsin Act 67 [2017 Assembly Bill 479]	Various Changes Relating to Zoning and Land Use

2017 Wisconsin Act 67 makes various changes, described below, relating to zoning, local government authority with respect to property, and the display of the United States flag.

ZONING

Conditional Use Permits

Under **prior law**, retained by the Act, conditional use permits are typically required to be approved by the relevant zoning authority in a city, village, town, or county before a person may use property in a manner that is designated as a conditional use within a given zoning district.[1]

The Act requires a city, village, town, or county to grant a conditional use permit if an applicant meets, or agrees to meet, all of the requirements and conditions specified in the relevant ordinance or imposed by the relevant zoning board. Any such conditions must be related to the purpose of the ordinance and based on substantial evidence.[2] In addition, the Act requires those requirements and conditions to be reasonable and, to the extent practicable, measurable.

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[1] In *AllEnergy Corporation v. Trempealeau County Environment and Land Use Committee*, 2017 WI 52, a majority of Wisconsin Supreme Court justices rejected an argument that, in that particular case, a land use committee acted outside the scope of its authority because it denied a conditional use permit application based in part on general concerns raised by the public.

[2] The Act defines "substantial evidence" to mean facts and information, other than merely personal preference or speculation, directly pertaining to the requirements and conditions an applicant must meet to obtain a conditional use permit and that reasonable persons would accept in support of a conclusion.

One East Main Street, Suite 401 • Madison, WI 53703-3382
(608) 266-1304 • Fax: (608) 266-3830 • Email: leg.council@legis.wisconsin.gov
http://www.legis.wisconsin.gov/lc

The Act requires an applicant for a conditional use permit to demonstrate, with substantial evidence, that an application and all requirements and conditions relating to the conditional use are, or will be, satisfied. The Act then requires a city, village, town, or county to demonstrate that its decision to approve or deny the permit application is supported by substantial evidence.

The Act specifies that a conditional use permit may remain in effect as long as the conditions upon which the permit was issued are followed, except that a city, village, town, or county may impose conditions relating to the permit's duration, and the ability of the applicant to transfer or renew the permit, as well as any other additional, reasonable conditions specified in the relevant zoning ordinance or by the relevant zoning board.

The Act requires a public hearing to be held on a conditional use permit application and authorizes a person whose conditional use permit application is denied to appeal the decision in circuit court.

Door County Zoning Ordinance Text Amendments - Due to 2017 Wisconsin Act 67

Note: Red font indicates proposed changes. The "overstrike" function indicates text to be deleted.

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Amend section 2.04(1)(c) to read as follows:

(c) Uses permitted as conditional uses. These uses will be allowed, and a conditional use permit will be granted ~~are not permitted by right. Rather, their allowance is subject to the discretionary judgment of the Resource Planning Committee~~, if the applicant demonstrates, by substantial evidence, that the application and all requirements and conditions established by the county as specified in the ordinance or imposed by the Resource Planning Committee are or will be satisfied. See also ~~as described in~~ s. 11.04, conditional use permits.

Amend section 11.04, conditional use permits, to read as follows:

11.04 Conditional use permits.

(1) Applicability. A conditional use permit shall be required for the establishment of each use permitted as a conditional use and for an addition to, or the expansion or intensification of, a nonconforming use. Expansion of a use permitted as a conditional use shall also require a conditional use permit, except that the minor expansion of a building housing a use permitted as a conditional use which would not increase the scale or intensity of that use shall only require a regular zoning permit.

(2) Application.

(a) An application for a conditional use permit shall be submitted to the Zoning Administrator upon forms furnished by the Door County Planning Department. The application shall contain ~~the following~~ facts and information, other than merely personal preferences or speculation, directly pertaining to the conditions and requirements relating to the conditional use, including the following:

1. All the facts and information required for a regular zoning permit listed in s. 11.01(2)(a), and a completed conditional use permit form addendum. (Amended: 30 September 1997, Ord. 29-97)

2. Upon written request by the Zoning Administrator, such additional facts and information as may be reasonably deemed necessary ~~required~~ by the Zoning Administrator ~~so~~ in order that the Resource Planning Committee can determine whether or not the application and all requirements and conditions the applicant must meet to obtain a conditional use permit are or will be satisfied ~~proposed use at the proposed location will not be contrary to the public interest and will not be detrimental or injurious to public health, public safety, or the character of the surrounding area~~. The written request shall contain an explanation of why the additional information is deemed necessary ~~needed~~.

3. Water supply and sewage disposal. Where the proposed use involves human occupancy, satisfactory evidence that a safe and adequate supply of water and approved sewage disposal facilities will be provided, in accordance with the

requirements of the Door County Sanitary Ordinance, shall be submitted.

(b) Fee. All conditional use permit applications shall be accompanied by a fee established by the County Board of Supervisors.

(c) No application shall be accepted by the Zoning Administrator until complete as judged by the Zoning Administrator and until all fees established by Door County have been paid in full. The applicant bears the burden of ensuring and demonstrating that an application is complete.

(3) Public hearing. A public hearing shall be held by the Resource Planning Committee after a public notice has been given as provided in s. 11.09(1), notice for public hearings. At the public hearing, any party may appear in person or by agent or attorney. The applicant has the burden of proof and must demonstrate that the application and all requirements and conditions established by the county relating to the conditional use are or shall be satisfied, both of which must be supported by substantial evidence.

(4) Determination. Following review~~, investigation,~~ and public hearing, the Resource Planning Commi~~ssion~~ttee shall render a decision in writing.

(a) If the application is approved, such decision shall include an accurate and complete description of the use as permitted, including all the conditions and requirements attached thereto.

(b) If the application is denied, the reasons for denial shall be stated in the decision.

(5) Basis of approval or denial.

(a) The Resource Planning Committee shall review each conditional use permit application for compliance with all requirements applicable to that specific use and to all other relevant provisions of this Ordinance. The Committee's decision to approve or deny the conditional use permit must be supported by substantial evidence. ~~In approving conditional uses, the Resource Planning Committee also shall determine that the proposed use at the proposed location will not be contrary to the public interest and will not be detrimental or injurious to the public health, public safety, or character of the surrounding area.~~

(b) To aid in the review of and decision-making regarding the proposed conditional use project ~~against the above criteria~~, the Resource Planning Committee shall evaluate the following specific criteria as applicable, but shall not be limited thereto: (Amended: 30 September 1997, Ord. 29-97)

1. Whether the proposed project will adversely affect property values in the area.

2. Whether the proposed use is similar to other uses in the area.

3. Whether the proposed project is consistent with the Door County Comprehensive and Farmland Preservation Plan or any officially adopted town plan. (Amended: 17 April 2012, Ord. No. 2012-14) (Amended: 20 Sept. 2016; Ord. 2016-14)

4. Provision of an approved sanitary waste disposal system.

5. Provision for a potable water supply.

6. Provisions for solid waste disposal.

7. Whether the proposed use creates noise, odor, or dust.

8. Provision of safe vehicular and pedestrian access.

9. Whether the proposed project adversely impacts neighborhood traffic flow and congestion.

10. Adequacy of emergency services and their ability to service the site.

11. Provision for proper surface water drainage.

12. Whether proposed buildings contribute to visual harmony with existing buildings in the neighborhood, particularly as related to scale and design.

13. Whether the proposed project creates excessive exterior lighting glare or spillover onto neighboring properties.

14. Whether the proposed project leads to a major change in the natural character of the area through the removal of natural vegetation or altering of the topography.

15. Whether, and in what amount and form, financial assurance is necessary to meet the objectives of this ordinance.

16. Whether, and to what extent, site-specific conditions should be imposed to mitigate potentially problematic impacts of the use.

17. The impact of the proposed project on public health, public safety, or the general welfare of the County.

The foregoing criteria are deemed reasonable and, to the extent practicable, measurable.

(c) ~~The~~ An applicant~~'s~~ failure to demonstrate, by substantial evidence, that the application and ~~satisfy the criteria listed in par. (b) or any other~~ all applicable requirements in this Ordinance and conditions established by the county relating to the conditional use are or will be satisfied shall ~~may~~ be grounds to deny the conditional use permit. At all times the burden of proof to demonstrate satisfaction of these criteria remains with the applicant.

(d) In the Exclusive Agricultural district, no conditional use permit shall be granted unless the proposed use is consistent with agricultural use and is found to be necessary in light of the alternative locations available for such use. (Added: 28 March

2000, Ord. No. 05-00)

(6) Conditions and ~~restrictions~~ requirements. The Resource Planning Committee may, in approving an application for a conditional use permit, impose such ~~restrictions and~~ conditions and requirements that it determines are required to prevent or minimize adverse effects from the proposed use or development on other properties in the neighborhood and on the general health, safety, and welfare of the county.

(a) ~~Such~~ Any conditions or requirements imposed must be:

1. ~~may include financial sureties~~ reasonable;
2. measurable, to the extent practical;
3. consistent with this ordinance's general purpose and intent; and
4. based on substantial evidence.

(b) The applicant must demonstrate, by substantial evidence, that all conditions or requirements imposed will be met.

(7) Expiration, Duration, Transfer.

(a) Expiration. All conditional use permits shall expire 12 months from the date of authorization by the Resource Planning Committee where the Resource Planning Committee determines that no action has commenced to establish the authorized use. (Amended: 01 November 1999; Ord. 22-99)

(b) Duration. A conditional use permit will generally remain in effect as long as the conditions and requirements upon which the permit was issued are followed. The Resource Planning Committee may, at its discretion, grant a limited term conditional use permit if a reasonable basis exists for such limitation. Any limited term conditional use permit may be subject to renewal after a re-evaluation of the use via a hearing before the Resource Planning Committee.

(c) Transfer. Subsequent owners of the property are generally allowed to continue the use, subject to conditions and requirements imposed on the original conditional use permit. An affidavit is to be recorded with the deed to provide successors in interest notice of the conditional use permit and conditions and requirements.

(8) Project Completion. All conditional uses authorized by the Resource Planning Committee shall be given a specific amount of time within which the project must be completed. The time limit may be negotiated between the project applicant and the Resource Planning Committee. If the applicant fails to complete the approved project within the designated time period, the ~~Resource Planning Committee may either extend the time limit or require~~ permit expires and the applicant ~~to~~ must seek a new conditional use permit authorizing the remainder of the project. (Added: 01 November 1999, Ord. 22-99)

(9) Notification.

(a) Deleted: 25 June 2013, Ord. 2013-11

(b) Pursuant to NR 115.05(4)(h), Wis. Admin. Code, a copy of any conditional use

decision which affects shorelands shall be provided to the district office of the Department of Natural Resources within 10 days of the date such decision is rendered. (Amended: 27 May 2014; Ord. 2014-10)

(10) Revocation and Termination.

(a) Revocation. ~~If an established conditional use does not continue in conformity with the permit or this Ordinance, the~~ A conditional use permit ~~shall~~ may be ~~terminated~~ revoked by ~~action of~~ the Resource Planning Committee after a hearing, if it is determined that the requirements and conditions upon which the permit was issued have not been followed. Revocation of a conditional use permit is not considered a taking without just compensation because a conditional use permit is a type of zoning designation and not a property right.

(b) Termination. If an established use listed as a conditional use in 2.05(3) ceases for a period of more than 18 months, any future activity shall require a new permit. If requested by the Zoning Administrator, the Resource Planning Committee shall make a determination as to whether or not the use is to be considered ceased. (Amended: 01 November 1999, Ord. 22-99)

(11) Resubmission. A conditional use permit application that has been heard and decided shall not be eligible to be resubmitted during the 6 months following the decision. The 6 month period may be waived by the Resource Planning Committee, provided that the applicant submits a written report identifying how the new application differs materially from the previous application or identifying substantial new evidence that will be offered, and provided that the Resource Planning Committee votes, by simple majority, that the changes or new evidence would be of such significance that the Committee might consider changing the previous decision.

Amend s. 13.02, definitions, to read as follows:

Burden of Proof: The burden of moving forward with the production of evidence and the burden of persuasion (or risk of non-persuasion).

Conditional Use: A use allowed under a conditional use permit. Specifically, a use whose nature, character, or circumstance is so unique or so dependent upon specific conditions that predetermination of permissibility by right is not practical, but which may be permitted on a case-by-case basis subject to the conditional use permit procedure. (Added: 24 Nov 1998, Ord. 33-98)

Conditional Use Permit: A permit, issued by the Resource Planning Committee, stating that a use permitted as a conditional use may be established, expanded, or enlarged subject to any conditions placed on the authorization and the provisions of this Ordinance. (Added: 24 Nov 1998, Ord. 33-98)

Substantial evidence: Facts and information, other than merely personal preferences or speculation, directly pertaining to the requirements and conditions an applicant must meet to obtain a conditional use permit and that reasonable persons would accept in support of a conclusion.

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DOOR COUNTY

AMENDATORY ZONING ORDINANCE 2018 – 06

AMENDMENTS TO THE TEXT OF THE DOOR COUNTY COMPREHENSIVE ZONING ORDINANCE

The Door County Board of Supervisors, pursuant to Section 59.69(5)(e), Wisconsin Statutes, does hereby amend the Door County Comprehensive Zoning Ordinance to read as follows:

See Attachment A, incorporated by reference herein as if fully set forth.

Pursuant to Section 59.69(5)(e)6, Wisconsin Statutes, this ordinance shall become effective upon passage.

SUBMITTED BY:
Resource Planning Committee

Kenneth Fisher, Chair

Mark Moeller

Susan Kohout

David Enigl

Jon Koch

ROLL CALL Board Members	Aye	Nay	Exc.
AUSTAD	X		
BACON	X		
D. ENGLEBERT	X		
R. ENGLEBERT	X		
ENIGL	X		
FISHER	X		
GUNNLAUGSSON			X
HALSTEAD	X		
KOCH	X		
KOHOUT	X		
LIENAU	X		
LUNDAHL	X		
MOELLER	X		
NEINAS	X		
ROBILLARD	X		
SCHULTZ	X		
SITTE			X
SOHNS	X		
VIRLEE	X		
VLIES WOTACHEK	X		
WATT	X		
	19	0	2

BOARD ACTION

Vote Required: Majority Roll Call Vote of a Quorum

Motion to Approve — Adopted [X]
1st Fisher — Defeated [ ]
2nd Kohout
Yes: 19 No: 0 Exc: 2

Reviewed by: , Corp. Counsel
Reviewed by: , Administrator

Certification:

I, Jill M. Lau, Clerk of Door County, hereby certify that the above is a true and correct copy of an ordinance that was enacted on the 27th day of March, 2018 by the Door County Board of Supervisors.

Jill M. Lau
County Clerk, Door County

COUNTERSIGNED:

David Lienau, Chairman
Door County Board of Supervisors

Effective Date: 3/27/18

State of Wisconsin

Date of enactment: **November 27, 2017**
2017 Assembly Bill 479 Date of publication*: **November 28, 2017**

2017 WISCONSIN ACT 67

AN ACT ***to renumber and amend*** 59.694 (7) (c) and 62.23 (7) (e) 7.; ***to amend*** 59.69 (10e) (title), 59.69 (10e) (a) 1., 59.69 (10e) (b), 60.61 (5e) (title), 60.61 (5e) (a) 1., 60.61 (5e) (b), 62.23 (7) (hb) (title), 62.23 (7) (hb) 1. a. and 62.23 (7) (hb) 2.; and ***to create*** 59.69 (5e), 59.694 (7) (c) 1., 59.694 (7) (c) 3., 60.61 (4e), 60.62 (4e), 62.23 (7) (de), 62.23 (7) (e) 7. a., 62.23 (7) (e) 7. d., 66.10015 (1) (e), 66.10015 (2) (e), 66.10015 (4), 227.10 (2p) and 710.17 of the statutes; **relating to:** limiting the authority of local governments to regulate development on substandard lots and require the merging of lots; requiring a political subdivision to issue a conditional use permit under certain circumstances; standards for granting certain zoning variances; local ordinances related to repair, rebuilding, and maintenance of certain nonconforming structures; and the right to display the flag of the United States.

The people of the state of Wisconsin, represented in senate and assembly, do enact as follows:

SECTION 2. 59.69 (5e) of the statutes is created to read:

59.69 **(5e)** CONDITIONAL USE PERMITS. (a) In this subsection:

1. "Conditional use" means a use allowed under a conditional use permit, special exception, or other special zoning permission issued by a county, but does not include a variance.

2. "Substantial evidence" means facts and information, other than merely personal preferences or speculation, directly pertaining to the requirements and conditions an applicant must meet to obtain a conditional use permit and that reasonable persons would accept in support of a conclusion.

(b) 1. If an applicant for a conditional use permit meets or agrees to meet all of the requirements and conditions specified in the county ordinance or those imposed by the county zoning board, the county shall grant the conditional use permit. Any condition imposed must be related to the purpose of the ordinance and be based on substantial evidence.

2. The requirements and conditions described under subd. 1. must be reasonable and, to the extent practicable, measurable and may include conditions such as the permit's duration, transfer, or renewal. The applicant must demonstrate that the application and all requirements and conditions established by the county relating to the conditional use are or shall be satisfied, both of which must be supported by substantial evidence. The county's decision to approve or deny the permit must be supported by substantial evidence.

(c) Upon receipt of a conditional use permit application, and following publication in the county of a class 2 notice under ch. 985, the county shall hold a public hearing on the application.

(d) Once granted, a conditional use permit shall remain in effect as long as the conditions upon which the permit was issued are followed, but the county may impose conditions such as the permit's duration, transfer, or renewal, in addition to any other conditions specified in the zoning ordinance or by the county zoning board.

* Section 991.11, WISCONSIN STATUTES: Effective date of acts. "Every act and every portion of an act enacted by the legislature over the governor's partial veto which does not expressly prescribe the time when it takes effect shall take effect on the day after its date of publication."

(e) If a county denies a person's conditional use permit application, the person may appeal the decision to the circuit court under the procedures contained in s. 59.694 (10).

SECTION 3. 59.69 (10e) (title) of the statutes is amended to read:

59.69 **(10e)** (title) REPAIR, REBUILDING, AND MAINTENANCE OF CERTAIN NONCONFORMING STRUCTURES.

SECTION 4. 59.69 (10e) (a) 1. of the statutes is amended to read:

59.69 **(10e)** (a) 1. "Development regulations" means the part of a zoning ordinance ~~enacted under this section~~ that applies to elements including setback, height, lot coverage, and side yard.

SECTION 5. 59.69 (10e) (b) of the statutes is amended to read:

59.69 **(10e)** (b) An ordinance ~~enacted under this section~~ may not prohibit, ~~or~~ limit based on cost, or require a variance for the repair, maintenance, renovation, rebuilding, or remodeling of a nonconforming structure or any part of a nonconforming structure.

SECTION 8. 59.694 (7) (c) of the statutes is renumbered 59.694 (7) (c) 2. and amended to read:

59.694 **(7)** (c) 2. To authorize upon appeal in specific cases variances from the terms of the ordinance that will not be contrary to the public interest, where, owing to special conditions, a literal enforcement of the provisions of the ordinance will result in unnecessary hardship, and so that the spirit of the ordinance shall be observed and substantial justice done.

4. A county board may enact an ordinance specifying an expiration date for a variance granted under this paragraph if that date relates to a specific date by which the action authorized by the variance must be commenced or completed. If no such ordinance is in effect at the time a variance is granted, or if the board of adjustment does not specify an expiration date for the variance, a variance granted under this paragraph does not expire unless, at the time it is granted, the board of adjustment specifies in the variance a specific date by which the action authorized by the variance must be commenced or completed. An ordinance enacted after April 5, 2012, may not specify an expiration date for a variance that was granted before April 5, 2012.

5. A variance granted under this paragraph runs with the land.

SECTION 9. 59.694 (7) (c) 1. of the statutes is created to read:

59.694 **(7)** (c) 1. In this paragraph:

a. "Area variance" means a modification to a dimensional, physical, or locational requirement such as the setback, frontage, height, bulk, or density restriction for a structure that is granted by the board of adjustment under this subsection.

b. "Use variance" means an authorization by the board of adjustment under this subsection for the use of land for a purpose that is otherwise not allowed or is prohibited by the applicable zoning ordinance.

SECTION 10. 59.694 (7) (c) 3. of the statutes is created to read:

59.694 **(7)** (c) 3. A property owner bears the burden of proving "unnecessary hardship," as that term is used in this paragraph, for an area variance, by demonstrating that strict compliance with a zoning ordinance would unreasonably prevent the property owner from using the property owner's property for a permitted purpose or would render conformity with the zoning ordinance unnecessarily burdensome or, for a use variance, by demonstrating that strict compliance with the zoning ordinance would leave the property owner with no reasonable use of the property in the absence of a variance. In all circumstances, a property owner bears the burden of proving that the unnecessary hardship is based on conditions unique to the property, rather than considerations personal to the property owner, and that the unnecessary hardship was not created by the property owner.

SECTION 11. 60.61 (4e) of the statutes is created to read:

60.61 **(4e)** CONDITIONAL USE PERMITS. (a) In this subsection:

1. "Conditional use" means a use allowed under a conditional use permit, special exception, or other special zoning permission issued by a town, but does not include a variance.

2. "Substantial evidence" means facts and information, other than merely personal preferences or speculation, directly pertaining to the requirements and conditions an applicant must meet to obtain a conditional use permit and that reasonable persons would accept in support of a conclusion.

(b) 1. If an applicant for a conditional use permit meets or agrees to meet all of the requirements and conditions specified in the town ordinance or those imposed by the town zoning board, the town shall grant the conditional use permit. Any condition imposed must be related to the purpose of the ordinance and be based on substantial evidence.

2. The requirements and conditions described under subd. 1. must be reasonable and, to the extent practicable, measurable and may include conditions such as the permit's duration, transfer, or renewal. The applicant must demonstrate that the application and all requirements and conditions established by the town relating to the conditional use are or shall be satisfied, both of which must be supported by substantial evidence. The town's decision to approve or deny the permit must be supported by substantial evidence.

(c) Upon receipt of a conditional use permit application, and following publication in the town of a class 2 notice under ch. 985, the town shall hold a public hearing on the application.

(d) Once granted, a conditional use permit shall remain in effect as long as the conditions upon which the permit was issued are followed, but the town may impose conditions such as the permit's duration, transfer, or renewal, in addition to any other conditions specified in the zoning ordinance or by the town zoning board.

(e) If a town denies a person's conditional use permit application, the person may appeal the decision to the circuit court under the procedures described in s. 59.694 (10).

SECTION 12. 60.61 (5e) (title) of the statutes is amended to read:

60.61 **(5e)** (title) REPAIR, REBUILDING, AND MAINTENANCE OF CERTAIN NONCONFORMING STRUCTURES.

SECTION 13. 60.61 (5e) (a) 1. of the statutes is amended to read:

60.61 **(5e)** (a) 1. "Development regulations" means the part of a zoning ordinance ~~enacted under this section~~ that applies to elements including setback, height, lot coverage, and side yard.

SECTION 14. 60.61 (5e) (b) of the statutes is amended to read:

60.61 **(5e)** (b) An ordinance ~~enacted under this section~~ may not prohibit, ~~or~~ limit based on cost, or require a variance for the repair, maintenance, renovation, rebuilding, or remodeling of a nonconforming structure or any part of a nonconforming structure.

SECTION 15. 60.62 (4e) of the statutes is created to read:

60.62 **(4e)** (a) In this subsection:

1. "Conditional use" means a use allowed under a conditional use permit, special exception, or other special zoning permission issued by a town, but does not include a variance.

2. "Substantial evidence" means facts and information, other than merely personal preferences or speculation, directly pertaining to the requirements and conditions an applicant must meet to obtain a conditional use permit and that reasonable persons would accept in support of a conclusion.

(b) 1. If an applicant for a conditional use permit meets or agrees to meet all of the requirements and conditions specified in the town ordinance or those imposed by the town zoning board, the town shall grant the conditional use permit. Any condition imposed must be related to the purpose of the ordinance and be based on substantial evidence.

2. The requirements and conditions described under subd. 1. must be reasonable and, to the extent practicable, measurable and may include conditions such as the permit's duration, transfer, or renewal. The applicant must demonstrate that the application and all requirements and conditions established by the town relating to the conditional use are or shall be satisfied, both of which must be supported by substantial evidence. The town's decision to approve or deny the permit must be supported by substantial evidence.

(c) Upon receipt of a conditional use permit application, and following publication in the town of a class 2 notice under ch. 985, the town shall hold a public hearing on the application.

(d) Once granted, a conditional use permit shall remain in effect as long as the conditions upon which the permit was issued are followed, but the town may impose conditions such as the permit's duration, transfer, or renewal, in addition to any other conditions specified in the zoning ordinance or by the town zoning board.

(e) If a town denies a person's conditional use permit application, the person may appeal the decision to the circuit court under the procedures described in s. 61.35.

SECTION 16. 62.23 (7) (de) of the statutes is created to read:

62.23 **(7)** (de) *Conditional use permits.* 1. In this paragraph:

a. "Conditional use" means a use allowed under a conditional use permit, special exception, or other special zoning permission issued by a city, but does not include a variance.

b. "Substantial evidence" means facts and information, other than merely personal preferences or speculation, directly pertaining to the requirements and conditions an applicant must meet to obtain a conditional use permit and that reasonable persons would accept in support of a conclusion.

2. a. If an applicant for a conditional use permit meets or agrees to meet all of the requirements and conditions specified in the city ordinance or those imposed by the city zoning board, the city shall grant the conditional use permit. Any condition imposed must be related to the purpose of the ordinance and be based on substantial evidence.

b. The requirements and conditions described under subd. 2. a. must be reasonable and, to the extent practicable, measurable and may include conditions such as the permit's duration, transfer, or renewal. The applicant must demonstrate that the application and all requirements and conditions established by the city relating to the conditional use are or shall be satisfied, both of which must be supported by substantial evidence. The city's decision to approve or deny the permit must be supported by substantial evidence.

3. Upon receipt of a conditional use permit application, and following publication in the city of a class 2 notice under ch. 985, the city shall hold a public hearing on the application.

4. Once granted, a conditional use permit shall remain in effect as long as the conditions upon which the permit was issued are followed, but the city may impose conditions such as the permit's duration, transfer, or

renewal, in addition to any other conditions specified in the zoning ordinance or by the city zoning board.

5. If a city denies a person's conditional use permit application, the person may appeal the decision to the circuit court under the procedures contained in par. (e) 10.

Section 17. 62.23 (7) (e) 7. of the statutes is renumbered 62.23 (7) (e) 7. b. and amended to read:

62.23 **(7)** (e) 7. b. The board of appeals shall have the following powers: To hear and decide appeals where it is alleged there is error in any order, requirement, decision, or determination made by an administrative official in the enforcement of this section or of any ordinance adopted pursuant thereto; to hear and decide special exception to the terms of the ordinance upon which such board is required to pass under such ordinance; to authorize upon appeal in specific cases such variance from the terms of the ordinance as will not be contrary to the public interest, where, owing to special conditions, a literal enforcement of the provisions of the ordinance will result in practical difficulty or unnecessary hardship, so that the spirit of the ordinance shall be observed, public safety and welfare secured, and substantial justice done.

e. The council of a city may enact an ordinance specifying an expiration date for a variance granted under this subdivision if that date relates to a specific date by which the action authorized by the variance must be commenced or completed. If no such ordinance is in effect at the time a variance is granted, or if the board of appeals does not specify an expiration date for the variance, a variance granted under this subdivision does not expire unless, at the time it is granted, the board of appeals specifies in the variance a specific date by which the action authorized by the variance must be commenced or completed. An ordinance enacted after April 5, 2012, may not specify an expiration date for a variance that was granted before April 5, 2012.

f. A variance granted under this subdivision runs with the land.

c. The board may permit in appropriate cases, and subject to appropriate conditions and safeguards in harmony with the general purpose and intent of the ordinance, a building or premises to be erected or used for such public utility purposes in any location which is reasonably necessary for the public convenience and welfare.

Section 18. 62.23 (7) (e) 7. a. of the statutes is created to read:

62.23 **(7)** (e) 7. a. In this subdivision, "area variance" means a modification to a dimensional, physical, or locational requirement such as a setback, frontage, height, bulk, or density restriction for a structure that is granted by the board of appeals under this paragraph. In this subdivision, "use variance" means an authorization by the board of appeals under this paragraph for the use of land for a purpose that is otherwise not allowed or is prohibited by the applicable zoning ordinance.

Section 19. 62.23 (7) (e) 7. d. of the statutes is created to read:

62.23 **(7)** (e) 7. d. A property owner bears the burden of proving "unnecessary hardship," as that term is used in this subdivision, for an area variance, by demonstrating that strict compliance with a zoning ordinance would unreasonably prevent the property owner from using the property owner's property for a permitted purpose or would render conformity with the zoning ordinance unnecessarily burdensome or, for a use variance, by demonstrating that strict compliance with a zoning ordinance would leave the property owner with no reasonable use of the property in the absence of a variance. In all circumstances, a property owner bears the burden of proving that the unnecessary hardship is based on conditions unique to the property, rather than considerations personal to the property owner, and that the unnecessary hardship was not created by the property owner.

Section 20. 62.23 (7) (hb) (title) of the statutes is amended to read:

62.23 **(7)** (hb) (title) *Repair, rebuilding, and maintenance of certain nonconforming structures.*

Section 21. 62.23 (7) (hb) 1. a. of the statutes is amended to read:

62.23 **(7)** (hb) 1. a. "Development regulations" means the part of a zoning ordinance ~~enacted under this subsection~~ that applies to elements including setback, height, lot coverage, and side yard.

Section 22. 62.23 (7) (hb) 2. of the statutes is amended to read:

62.23 **(7)** (hb) 2. An ordinance ~~enacted under this subsection~~ may not prohibit, or limit based on cost, the repair, maintenance, renovation, or remodeling of a nonconforming structure.

Section 23. 66.10015 (1) (e) of the statutes is created to read:

66.10015 **(1)** (e) "Substandard lot" means a legally created lot or parcel that met any applicable lot size requirements when it was created, but does not meet current lot size requirements.

Section 24. 66.10015 (2) (e) of the statutes is created to read:

66.10015 **(2)** (e) Notwithstanding any other law or rule, or any action or proceeding under the common law, no political subdivision may enact or enforce an ordinance or take any other action that prohibits a property owner from doing any of the following:

1. Conveying an ownership interest in a substandard lot.

2. Using a substandard lot as a building site if all of the following apply:

a. The substandard lot or parcel has never been developed with one or more of its structures placed partly upon an adjacent lot or parcel.

b. The substandard lot or parcel is developed to comply with all other ordinances of the political subdivision.

SECTION 25. 66.10015 (4) of the statutes is created to read:

66.10015 **(4)** Notwithstanding the authority granted under ss. 59.69, 60.61, 60.62, 61.35, and 62.23, no political subdivision may enact or enforce an ordinance or take any other action that requires one or more lots to be merged with another lot, for any purpose, without the consent of the owners of the lots that are to be merged.

SECTION 26. 227.10 (2p) of the statutes is created to read:

227.10 **(2p)** No agency may promulgate a rule or take any other action that requires one or more lots to be merged with another lot, for any purpose, without the consent of the owners of the lots that are to be merged.

SECTION 27. 710.17 of the statutes is created to read:

710.17 Right to display the flag of the United States. (1) DEFINITIONS. In this section:

(a) "Housing cooperative" means a cooperative incorporated under ch. 185 or organized under ch. 193 that owns residential property that is used or intended to be used, in whole or in part, by the members of the housing cooperative as their homes or residences.

(b) "Member of a homeowners' association" means a person that owns residential property within a subdivision, development, or other similar area that is subject to any policy or restriction adopted by a homeowners' association.

(c) "Member of a housing cooperative" means a member, as defined in s. 185.01 (5) or 193.005 (15), of a housing cooperative if the member uses or intends to use part of the property of the housing cooperative as the member's home or residence.

(2) RIGHT TO DISPLAY THE FLAG OF THE UNITED STATES. (a) Except as provided in sub. (3), a homeowners' association may not adopt or enforce a covenant, condition, or restriction, or enter into an agreement, that restricts or prevents a member of the homeowners' association from displaying the flag of the United States on property in which the member has an ownership interest and that is subject to any policy or restriction adopted by the homeowners' association.

(b) Except as provided in sub. (3), a housing cooperative may not adopt or enforce a covenant, condition, or restriction, or enter into an agreement, that restricts or prevents a member of the housing cooperative from displaying the flag of the United States on property of the housing cooperative to which the member has a right to exclusive possession or use.

(3) EXCEPTIONS. A homeowners' association or housing cooperative may adopt and enforce a covenant, condition, or restriction, or enter into an agreement, that does any of the following:

(a) Requires that any display of the flag of the United States must conform with a rule or custom for proper display and use of the flag set forth in 4 USC 5 to 10.

(b) Provides a reasonable restriction on the time, place, or manner of displaying the flag of the United States that is necessary to protect a substantial interest of the homeowners' association or housing cooperative.

SECTION 28. Initial applicability.

(1) RIGHT TO DISPLAY THE FLAG OF THE UNITED STATES. The treatment of section 710.17 of the statutes first applies to a covenant, condition, or restriction that is adopted, renewed, or modified, or to an agreement that is entered into, renewed, or modified, on the effective date of this subsection.

(2) CONDITIONAL USE PERMITS. The treatment of sections 59.69 (5e), 60.61 (4e), 60.62 (4e), and 62.23 (7) (de) of the statutes first applies to an application for a conditional use permit that is filed on the effective date of this subsection.

Vibra-Tech

Blasting Impact Analysis Report for Quarry Bluff Development in Door County, Wisconsin

Prepared for:
Quarry Bluff Development, LLC
P.O. Box 54
Fish Creek, WI 54212
Quarry Bluff Project
Door County, Wisconsin

Attention:
Mike Parent

DECEMBER 6, 2019
VIBRA-TECH, INC.
1263 Hamilton Parkway
Itasca, Illinois 60143

PURPOSE

This report will deal with general blasting practices and calculated ground vibrations generated at the proposed Quarry Bluff Development project in Door County, Wisconsin.

This review will concentrate on how blasting effects the nearby structures.

GENERAL DISCUSSION ON BLASTING AND VIBRATIONS

In today's society, explosives and their use are commonly feared and misunderstood. The general public is only exposed to the effects of explosives seen in the news after events such as the Oklahoma City bombing, the Persian Gulf Wars, and in Hollywood or television productions. Such exposure leads to the assumptions that explosives are difficult or impossible to control and that they are used solely for destructive purposes.

Such assumptions are false. In fact, explosives are used primarily for economic benefits. For example, in 2016, total U.S. production of commercial explosives was approximately 1.65 million metric tons (Mt), of which 81% was used for mining operations and another 16% for construction blasting. In Wisconsin, during 2016 a total of 14,500 metric tons of explosives was consumed[1]. Use of such quantities of explosives requires that their use be both controlled and predictable.

Open pit blasting employs small diameter holes, which are drilled vertically into the rock bench on a specific pattern, referred to as burden and spacing. These vertical blast holes are loaded with explosives such as ANFO (ammonium nitrate). Each hole fires individually producing many small blasts, milliseconds apart. The actual production blast is typically over in less than a second.

The majority of the explosive energy released in a blast is used to break rock. When the explosives detonate, it creates stress in the rock by gas pressure (not shock) in the blasthole. Radial cracks caused by the stress extend out from the blasthole and the rock is displaced towards the path of least resistance or the free face. Figure 1 demonstrates how this mechanism works in all blasting situations.

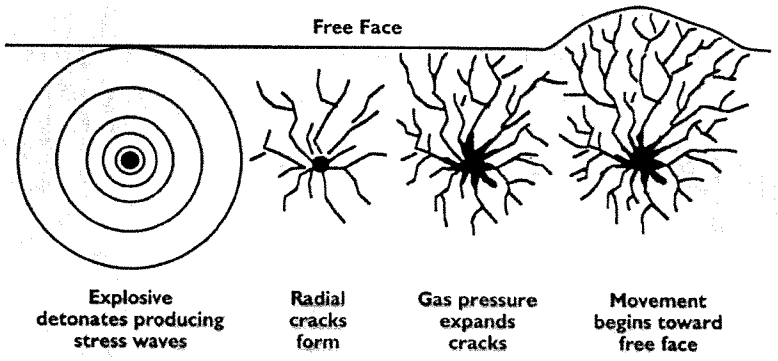


Figure 1: Rock Fragmentation during Blasting Event

[1] U.S. Geological Survey, Explosives 2016.

When explosives are detonated in their respective boreholes, most of the energy generated is consumed in the fracturing of rock very near the borehole, with some of the energy escaping into the surrounding terrain as elastic waves and into the air as noise or concussion. It is these effects which are perceived in structures located in their path. The major portion of energy released from the explosive detonation is expended in the fracturing of rock. The volume of rock that is permanently displaced (fractured) is ideally a cone with its apex at the bottom of the borehole and its base on the surface of the ground. The radius of the base is equal to the depth of the borehole. Beyond this cone-shaped volume, no permanent deformation (inelastic movement) of the rock occurs, and elastic waves are generated.

As the ground vibrations propagate further away from any source (blasting or construction activities), the energy is dissipated. When the energy dissipates, ground vibration amplitude decreases, until eventually the ground vibration falls below perceptible levels. The rate at which ground vibration amplitude decreases as it propagates away from the blast location is called seismic attenuation. Seismic attenuation has been studied extensively and found to occur geometrically. A geometric reduction in ground vibration means that ground vibration amplitude decreases very quickly near the source, but very slowly far from the source. As a result, almost all of the ground vibration energy is dissipated close to the source, but the small amount of energy remaining may produce perceptible vibrations at great distances.

The propagation of the ground vibration continues away from the source location in all directions, similar to ripples in a pond which move away from the initial disturbance. The ripples in the pond, like ground vibration, are examples of elastic vibration. Elastic vibration means that the material never moves very far from its original position while it is vibrating, and once the vibration event is over, the material will be in its original position and condition. Unlike the ripples in the pond, the motion of the ground is so small it cannot be detected visually. Therefore, sensitive scientific equipment is required for its measurement. Except in the very near vicinity of the source, the ground rarely moves farther than the thickness of a sheet of paper before returning to its original position, and it may do so faster than the eye can sense. Seismographs can measure how the ground moves from its original position much like a fisherman's bobber can detect how the water surface moves from rest when a ripple passes by.

Since various activities produce perceptible ground vibrations beyond their immediate location, attempts to control vibrations have been accomplished via laws, regulations, and industry standards. Maximum permissible levels have been established based on academic and government studies of the effects of vibration on nearby property and people. Seismographs are used to measure the vibrations, and ensure that the permissible levels are not exceeded. The seismograph may measure how far the ground moves from rest (displacement), how fast it moves (velocity), or how fast the velocity changes (acceleration). These three parameters are related by the frequency of the vibrations.

Frequency is a measure of how many times the ground will vibrate through its original position in one second. The seismograph also measures frequency, which is commonly reported in cycles per second or hertz (Hz). Standards limit the maximum amount of vibration that can occur at any point, or particle, on

the ground surface. The limit is therefore commonly referred to as a peak particle displacement, peak particle velocity, or peak particle acceleration. Nearly all residential vibration standards limit the peak particle velocity.

Ground Vibration and Air Overpressure Damage Criteria

Seismological research by the U.S. Bureau of Mines, foreign investigative groups and individual seismologists has established criteria relating the occurrence of structural damage to certain frequencies and levels of ground motion.

USBM Report of Investigations 8507[2] states that residential structures are most prone to damage as a result of vibration energy within the frequency range of 4-12 hertz. Within this range a 0.50 inch-per-second maximum particle velocity is recommended for the protection of plaster on lath interior construction. A maximum particle velocity of 0.75 inch-per-second is recommended for the protection of modern drywall interior construction. Above 12 hertz the maximum particle velocity limit increases as the frequency increases up to 40 hertz. Above 40 hertz, a constant 2.0 inches-per-second level is recommended to protect interior walls and ceilings of structures. Figure 2 is a graphical representation of the USBM recommended criteria as shown in the velocity versus frequency curve.

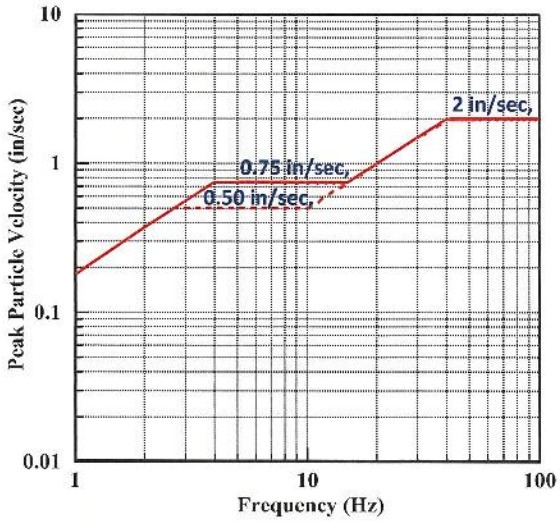


Figure 2: U.S. Bureau of Mines Recommended Vibration Criteria (From RI-8507)

The limits cited above are designed to prevent the occurrence of even threshold damage to the most brittle portions of a structure. More massive materials such as brick and mortar can withstand vibrations greater than 2.0 inches-per-second. A study by Crawford and Ward[3] established the threshold level of damage to be 3.0 inches-per-second for masonry walls regardless of type. Far greater velocities would be required to damage poured concrete.

In conjunction with the ground vibration recording, peak air overpressure was also monitored. Structural damage as a result of air overpressure is generally considered not to be possible without extensive window breakage, as the glass is the weakest portion of a structure's exterior where this

---

[2] Siskind, David et al, Structure Response and Damage Produced by the Ground Vibration from Blasting, U.S. Bureau of Mines RI 8507, 1980.

[3] Crawford, R., and H.S. Ward, Dynamic Strains in Concrete and Masonry Walls, National Research Council of Canada, Note 54, December 1965.

pressure acts. Windowpanes are designed to safely withstand changes of 1.0 psi (170 dB) when properly installed, and even in the worst situation a pane should be able to withstand 0.1 lbs/in (150 dB). Air overpressures from blasting rarely exceed 0.01 psi. (130 dB), about one one-hundredth of the overpressure that a window can safely withstand.

The U.S. Bureau of Mines has concluded in its Report of Investigations RI 8485[4] based on a minimal probability of the most superficial type of damage in a residential-type structure that 133 dB(L) represents a safe maximum air overpressure level for a 2 Hz High-Pass system.

Discussion of Proposed Blasting Operations at the Quarry Bluff Development

It is Vibra-Tech's understanding that rock blasting operations will be necessary for portions of the Quarry Bluff Development project. For the purposes of this report these operations are divided into three phases; trench blasting, blasting for the development of a pond with a 10 foot depth, and blasting for the development of a pond with an 18 foot depth. Figure 3 below shows a Concept Plan drawing for the project that has been marked up to show the approximate distances from each of these blasting operations to the closest neighboring properties.

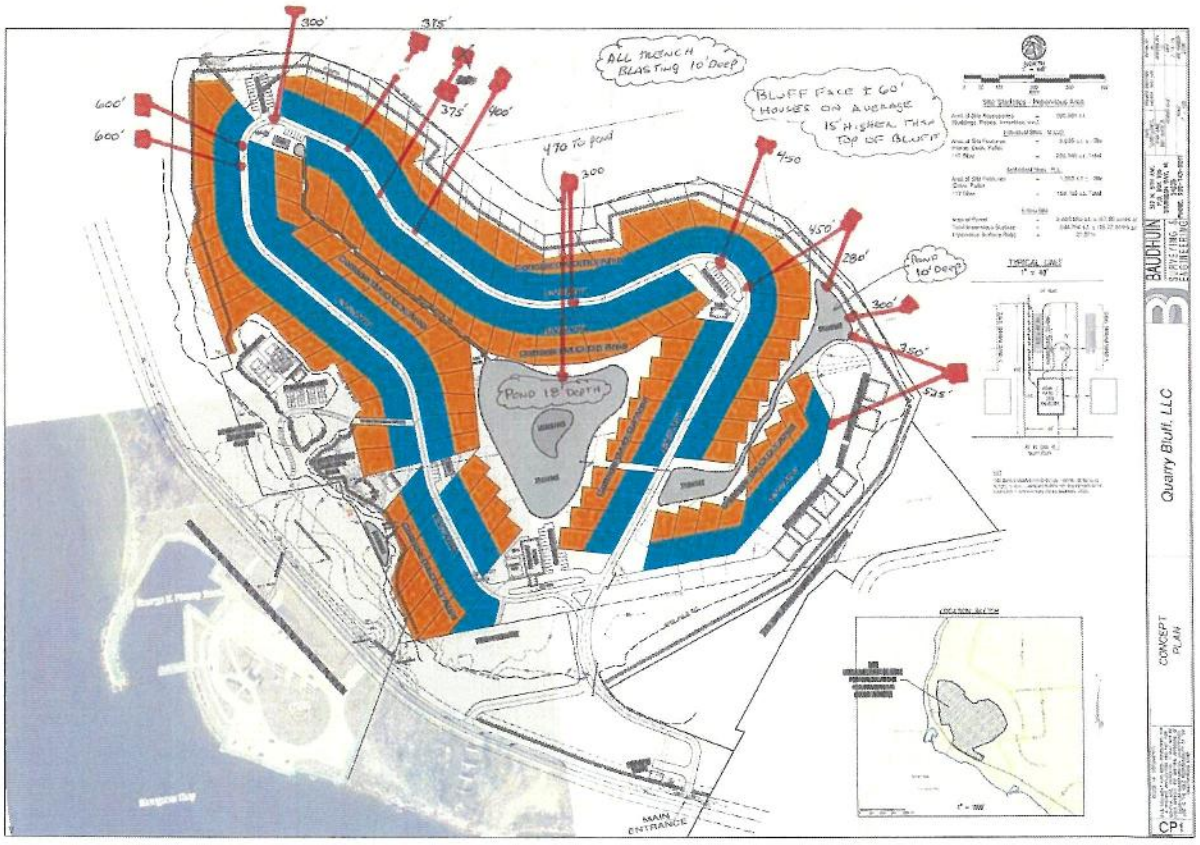


Figure 3: Concept Plan for Quarry Bluff Development with Distances to Neighboring Structures

[4] Siskind, David et al, Structure Response and Damage Produced by Airblast from Surface Mining, U.S. Bureau of Mines, RI 8485, 1980.

Based on the markups shown in Figure 3 the closest approximate distance from each of the blasting operations to any neighboring structure is as follows:

10 Foot Pond	280 feet
Trench Blasting	300 feet
18 Foot Pond	470 feet

Determining a calculated estimate of the vibration levels at a structure can be accomplished if the distance and maximum pounds per delay are known. The International Society of Explosive Engineers Blasters' Handbook[5] provides in chapter 26 a power law equation which may be used to estimate ground vibrations in the absence of seismic recordings. **The equation is very conservative, and most often overestimates the vibration level, meaning that actual vibrations are almost always less than those predicted by the formula.** The equation is as follows:

$$V=K\left(D / W^{0.5}\right)^{-1.6}$$

Where

V = peak particle velocity (PPV) in inches per second
K = numeric constant corresponding to blast confinement
D = distance between explosion and recording site in feet
W = maximum pounds-per-delay-period of 8ms or more
$(D/W^{0.5})$ = Scaled Distance

Conversely, the above formula can be rearranged to determine the allowable maximum pounds per delay that can be used in order to stay below a desired peak particle velocity at a given distance.

The Wisconsin Administrative Code, SPS 307.44 has adopted the USBM RI-8507 recommended blasting vibration limits that are shown earlier in Figure 2 of this report. However, the formula above cannot be used to predict the frequency content of the blast vibration as that is a function of geologic conditions and other site-specific factors. Therefore, in order to ensure that our recommendations are sufficiently conservative as to prevent any damage to the neighboring structures we must assume a worst-case scenario for typical blasting, which would result in a frequency content in the 4-12 hertz range. The allowable peak particle velocity at this frequency range would then be 0.50 inch-per-second for plaster-on-lath structures and 0.75 inch-per-second for modern drywall structures.

The blast confinement constant, K, must also be assumed to be a worst-case scenario for a conservative recommendation. Therefore, a value of 605 will be utilized for our calculations as this corresponds to the upper bound for blasting with high confinement. For reference, the upper bound for typical open pit blasting operations is 242. These K-values are derived from research by Oriard and are shown in Table 26.3 of the ISEE Blaster's Handbook.

[5] ISEE, Blaster's Handbook, 18th Edition, 2011, pp.567.

CONCLUSION

Utilizing the values discussed above results in the following:

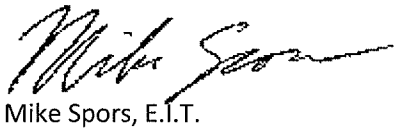
Blasting Operation	Closest Distance	Allowable PPV	K-Value	Maximum Pounds-per-delay
10 Foot Pond	280 feet	0.50	605	**11**
Trench	300 feet	0.50	605	**12.5**
18 Foot Pond	470 feet	0.50	605	**31**

Table 1: Recommendations for Maximum Pounds-Per-Delay

The maximum pounds-per-delay that are shown in Table 1 should be utilized by the blasting contractor in their blast design for each phase of the Quarry Bluff Development project in order to ensure that the resulting blasting vibrations are compliant with the Wisconsin Administrative Code, SPS 307.44.

We appreciate the opportunity to assist you with this project. If you have any questions or require additional information, please contact our office.

Sincerely,
VIBRA-TECH, INC.



Mike Spors, E.I.T.
Area Manager

All opinions expressed in this report are based upon a reasonable degree of engineering certainty and only upon the information that was made available to the author. Vibra-Tech, Inc. shall not be liable for any claims of tangible property damage where such damage is not solely, directly, and physically caused by Vibra-Tech, Inc. Additionally, Vibra-Tech, Inc. shall not be liable, in whole or in part, for any claims of tangible property damage brought by or on behalf of third-party claims.

Emailed received from:

Cap Paschke, Owner
Paschke Drilling and Blasting
3131 Bay View Drive
Green Bay, WI 54311

From: cap paschke <capblasts@live.com>
To: cblast4u@aol.com <cblast4u@aol.com>
Sent: Mon, Dec 9, 2019 1:57 pm
Subject: RE: Signed Doc

Hi Mike. I have read the article from Vibra Tech and I agree in the parameters that they have set, and I agree what's in the Wisconsin Administrative Code laws. With our 91 years blasting experience in Door County, I feel this job can be very safely blasted without any impact to neighbors or the environment.. Any questions please call Cap Paschke @ 920-621-9694

From: cblast4u@aol.com <cblast4u@aol.com>
Sent: Monday, December 9, 2019 12:21 PM
To: capblasts@live.com

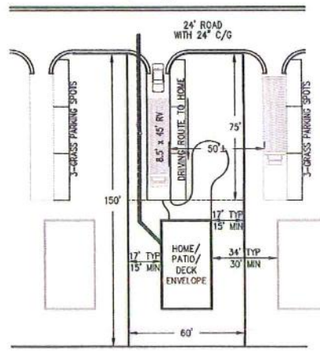
NORTH
1" = 100'

0 50 100 200 300 400
FEET

Site Statistics - Impervious Area

Area of Site Accessories (Buildings, Roads, Amenities, etc.)	=	286,964 s.f.
Individual Sites - M.O.D.		
Area of Site Features (Home, Deck, Patio)	=	2,035 s.f. ± / Site
115 Sites	=	234,025 s.f. Total
Individual Sites - R.V.		
Area of Site Features (Drive, Patio)	=	1,365 s.f. ± / Site
117 Sites	=	159,705 s.f. Total
Entire Site		
Area of Parcel	=	2,157,614 s.f. ± (49.53 acres ±)
Total Impervious Surface	=	680,694 s.f. ± (15.63 acres ±)
Impervious Surface Ratio	=	31.56%

TYPICAL UNIT
1" = 40'



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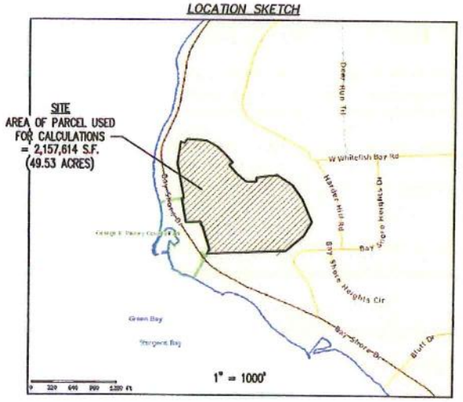

N

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PHONE: 920-743-8211

Quarry Bluff

SITE PLAN
TURNING RADII

SP1

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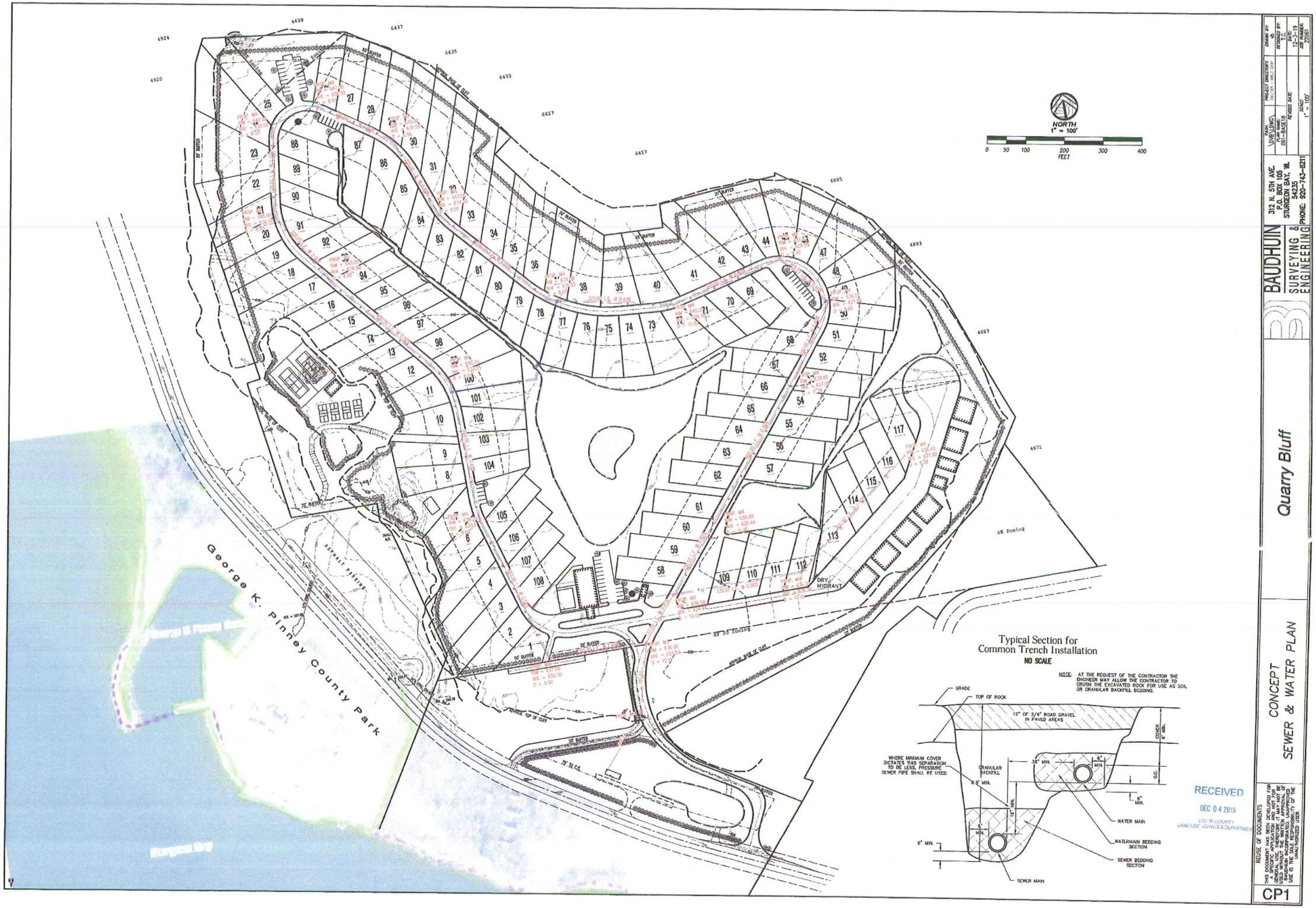
NORTH
1" = 100'
0 50 100 200 300 400
FEET
George K. Pinney County Park
DRY HYDRANT
SE Zoning
SF 20 Zoning
Typical Section for
Common Trench Installation
NO SCALE
NOTE: AT THE REQUEST OF THE CONTRACTOR THE ENGINEER MAY ALLOW THE CONTRACTOR TO CRUSH THE EXCAVATED ROCK FOR USE AS SOIL OR GRANULAR BACKFILL BEDDING.
GRADE
TOP OF ROCK
12" OF 3/4" ROAD GRAVEL IN PAVED AREAS
WHERE MINIMUM COVER DICTATES THIS SEPARATION TO BE LESS, PRESSURE SEWER PIPE SHALL BE USED.
GRANULAR BACKFILL
WATER MAIN
WATERMAIN BEDDING SECTION
SEWER BEDDING SECTION
SEWER MAIN
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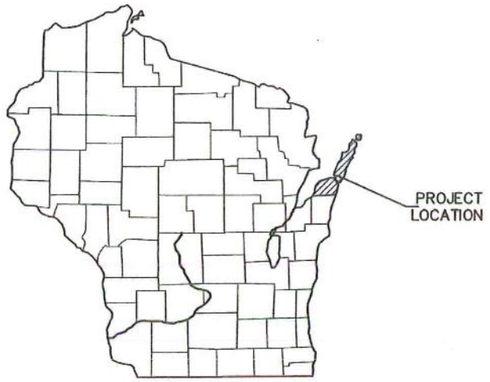
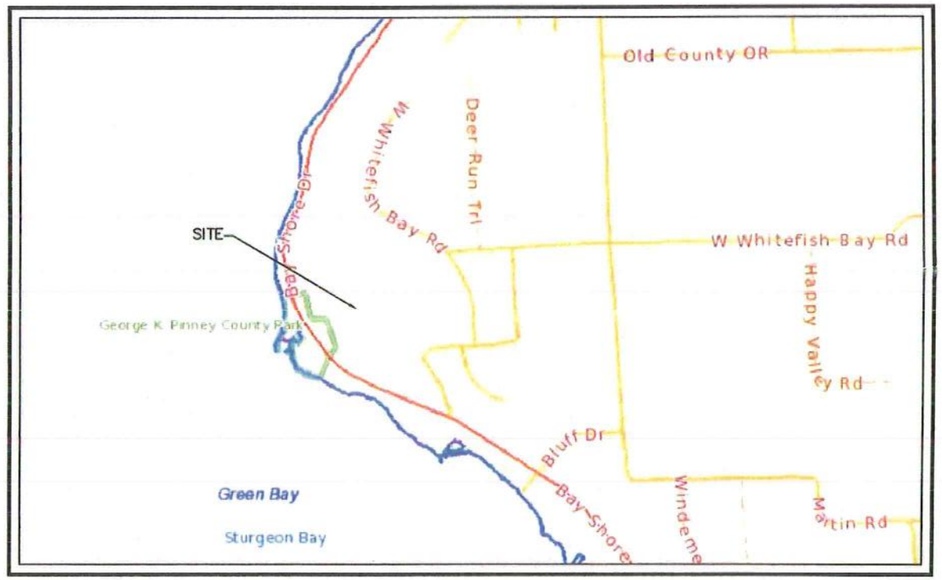
GRADING, DRAINAGE, & EROSION CONTROL PLANS

JOB NUMBER
22061





INDEX OF SHEETS

SHEET NO.	DESCRIPTION
C100	COVER & INDEX SHEET
C101	EXISTING SITE PLAN
C102	SITE PLAN
C103	GRADING PLAN
C104	EROSION CONTROL PLAN
C200	CONSTRUCTION DETAILS
C201	CONSTRUCTION DETAILS
C202	CONSTRUCTION DETAILS
C203	CONSTRUCTION DETAILS
C204	POND A DETAILS
C205	POND B DETAILS
C206	POND C DETAILS

PREPARED FOR:
QUARRY BLUFF, LLC
c/o MIKE PARENT
P.O. Box 889
SISTER BAY, WI 54234

WISCONSIN
RENEE BORKOVETZ
E-44617
DOOR COUNTY, WI
PROFESSIONAL ENGINEER
12/3/19

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54235
PHONE: 920-743-6211

FILE: Envision-Geds 22061.dwg
PLAT BASE: CSM-REC

PROJECT DIRECTOR: [illegible]

REVISED DATE:
12-3-19

DRAWN BY: RWE
CHECKED BY: JAT
DATE: 8-1-19
SCALE: AS NOTED
JOB NUMBER: 22061

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COVER & INDEX SHEET

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PATH: Dewitzer-Gwitz 22061\dwg
PLAN NAME: 061-DES
PROJECT DIRECTORY: Kirk Lund
REVISED DATE: 12-3-19
SCALE: AS NOTED
DRAWN BY: RMB
DESIGNED BY: PJH
DATE: 8-1-19
JOB NUMBER: 22061

Quarry Bluff

EXISTING SITE PLAN

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C101

NORTH
1" = 100'
0 50 100 200 300 400
FEET

Site Statistics - Impervious Area

Area of Site Accessories (Buildings, Roads, Amenities, etc.)	=	286,984 s.f.

Individual Sites - M.O.D.

Area of Site Features (Home, Deck, Patio)	=	2,035 s.f. ± / Site
115 Sites	=	234,025 s.f. Total

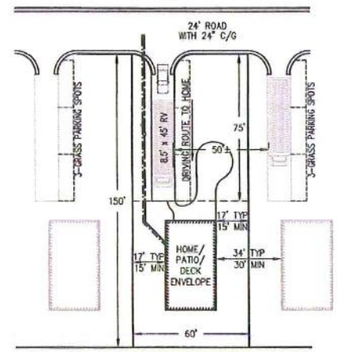
Individual Sites - R.V.

Area of Site Features (Drive, Patio)	=	1,365 s.f. ± / Site
117 Sites	=	159,705 s.f. Total

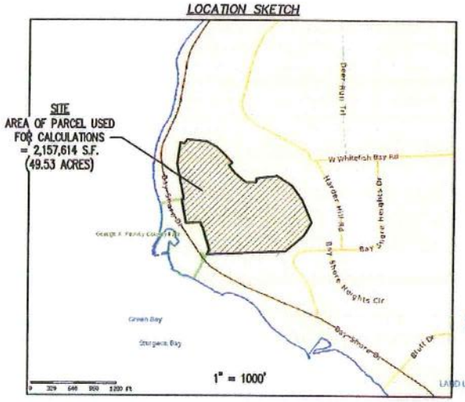
Entire Site

Area of Parcel	=	2,157,614 s.f. ± (49.53 acres ±)
Total Impervious Surface	=	680,694 s.f. ± (15.63 acres ±)
Impervious Surface Ratio	=	31.56%

TYPICAL UNIT
1" = 40'



LOCATION SKETCH



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DESIGNED BY: P.J.H.
M.J.H.
8-1-19
JOB NUMBER: 22061
SCALE: AS NOTED
PROJECT DIRECTORY
PATH: (Baudhuin Project Folders)\Work\
PLAT NAME: 061-DCS
PLOT DATE: 12-3-19

Quarry Bluff

SITE PLAN

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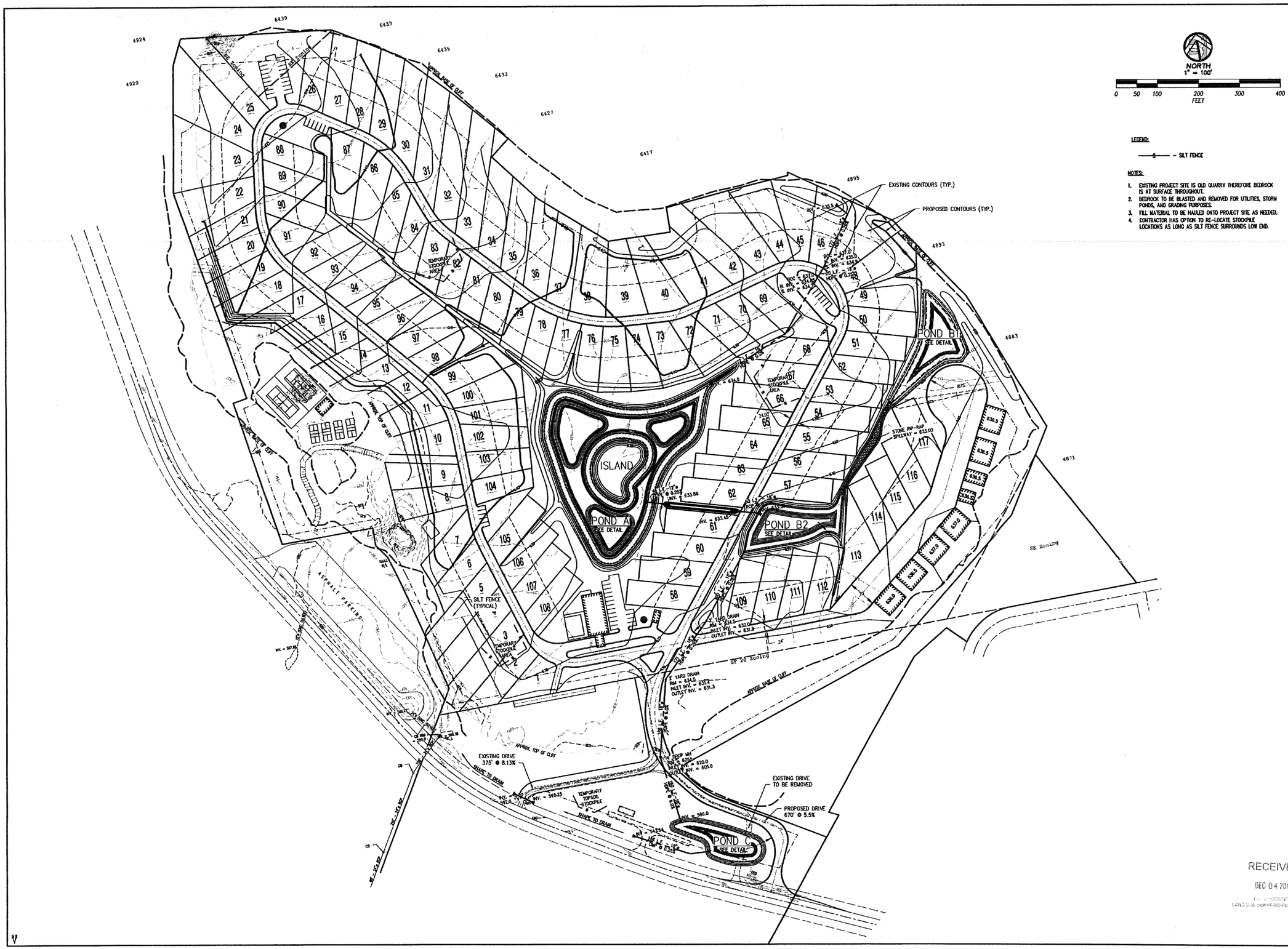

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54235
PHONE: 920-743-6211

PARK: Brussels - Code 72001(.dwg)
PLAN SHEET
GRADING PLAN
PROJECT DIRECTORY:
REVISED DATE: 12-4-19
DATE: 08-21-19
JOB # BAUD 22061
DRAWN BY: RMB
REVISED BY: PJH
AS NOTED

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GRADING PLAN

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DESIGNED BY: P.J.H.
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JOB NUMBER: 22061
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PATH: Dmitzer-Gwiz 22061\dwg
PLAN NAME: 061-DES
REVISED DATE: 12-3-19
SCALE: AS NOTED

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PHONE: 920-743-8211

Quarry Bluff

EROSION CONTROL PLAN

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C104

Erosion Control Notes

1. IN ACCORDANCE WITH NR 216.46(9) AND NR 216.48(4), THE LANDOWNER, OR THE LANDOWNER'S REPRESENTATIVE, SHALL INSPECT EROSION AND SEDIMENT CONTROL PRACTICES WEEKLY, AND WITHIN 24 HOURS FOLLOWING A RAINFALL OF 0.5 INCHES OR GREATER. WRITTEN DOCUMENTATION OF EACH INSPECTION SHALL BE MAINTAINED AT THE CONSTRUCTION SITE AND SHALL INCLUDE THE DATE, TIME AND LOCATION OF INSPECTION, THE PHASE OF LAND DISTURBANCE AT THE CONSTRUCTION SITE, PERSON CONDUCTING THE INSPECTION, ASSESSMENT OF CONTROL PRACTICES, AND A DESCRIPTION OF ANY EROSION OR SEDIMENT CONTROL MEASURE INSTALLATION OR MAINTENANCE PERFORMED IN RESPONSE TO THE INSPECTION.
2. ANY SOIL STOCKPILE THAT REMAINS FOR MORE THAN 7 DAYS SHALL BE COVERED OR TREATED WITH STABILIZATION PRACTICES SUCH AS TEMPORARY OR PERMANENT SEEDING AND MULCHING. SEEDING SHALL FOLLOW THE REQUIREMENTS OF WDNR TECHNICAL STANDARDS 1058 AND 1059 AND WIS. DOT STANDARD SPECIFICATIONS, SECTION 630.
3. A MINIMUM OF 4 TO 6 INCHES OF TOPSOIL MUST BE APPLIED TO ALL AREAS TO BE SEEDED OR SODDED ACCORDING TO WDNR TECHNICAL STANDARD 1059.
4. ALL OFF-SITE SEDIMENT DEPOSITS OCCURRING AS A RESULT OF CONSTRUCTION WORK OR STORM EVENT SHALL BE CLEANED UP BY THE END OF EACH DAY. FLUSHING SHALL NOT BE ALLOWED. IMPLEMENT TEMPORARY GRADING PRACTICES AS DESCRIBED IN WDNR TECHNICAL STANDARDS 1066 AND 1067 TO PREVENT SEDIMENT FROM LEAVING THE SITE.
5. ALL DISTURBED AREAS SHALL BE TREATED WITH STABILIZATION MEASURES, AS SPECIFIED, WITHIN 3 WORKING DAYS OF FINAL GRADING.
6. ANY SOIL EROSION THAT OCCURS AFTER FINAL GRADING AND/OR THE APPLICATION OF STABILIZATION MEASURES MUST BE REPAIRED AND STABILIZATION WORK REDONE.
7. TREAT ANY DISTURBED AREA THAT REMAINS INACTIVE FOR GREATER THAN 30 WORKING DAYS OR WHERE GRADING WORK EXTENDS BEYOND THE PERMANENT SEEDING DEADLINES WITH TEMPORARY BEST MANAGEMENT PRACTICES SUCH AS LAND APPLICATION OF ANIONIC POLYACRYLAMIDE, STRAW BALES, SILT FENCE, MULCHING, TEMPORARY SEEDING, AND SEDIMENT TRAPS AS RESPECTIVELY REQUIRED BY WDNR TECHNICAL STANDARDS 1050, 1055, 1056, 1058, 1059, AND 1063.
8. ALL TEMPORARY BEST MANAGEMENT PRACTICES SHALL BE MAINTAINED UNTIL THE SITE IS STABILIZED.
9. WIND EROSION SHALL BE KEPT TO A MINIMUM DURING CONSTRUCTION. WATERING, MULCHING, OR A TACKING AGENT MAY NEED TO BE UTILIZED TO PROTECT NEARBY RESIDENTS AND WATER RESOURCES. DUST CONTROL MEASURES SHALL BE IMPLEMENTED ACCORDING TO WDNR TECHNICAL STANDARD 1068.
10. WHEN THE DISTURBED AREA HAS BEEN STABILIZED BY PERMANENT VEGETATION OR OTHER MEANS, TEMPORARY BEST MANAGEMENT PRACTICES SUCH AS SILT FENCE, STRAW BALES, AND SEDIMENT TRAPS SHALL BE REMOVED.
11. ALL REMAINING TOPSOIL STOCKPILES SHALL BE SEEDED OR HAULED OFF-SITE WITHIN 60 DAYS OF CONSTRUCTION COMPLETION.
12. WINTER STABILIZATION : ALL AREAS REQUIRING SEED AFTER OCTOBER 15TH SHALL BE STABILIZED BY AN APPROVED WINTER STABILIZATION METHOD. THE RECOMMENDED METHOD IS UTILIZING A HYDROSEEDER CONTAINING ADEQUATE TACKIFIER POLYMER MIXED WITH WINTER WHEAT OR RYE SEED. ANOTHER ACCEPTABLE EROSION CONTROL METHOD IS THE LAND APPLICATION OF ANIONIC POLYACRYLAMIDE IN CONFORMANCE WITH WDNR TECHNICAL STANDARD 1050.
13. ADDITIONAL EROSION CONTROL METHODS SUCH AS SILT FENCE, BALE CHECKS, EROSION MAT, (ABOVE AND BEYOND THE QUANTITIES LISTED IN THE BID PROPOSAL) AS NEEDED TO PREVENT WASHOUT OR SILT TRANSFER PROBLEMS WITHIN THE CONSTRUCTION AREA OR DOWNSTREAM SHALL BE CONSIDERED INCIDENTAL TO THIS PROPOSAL.

Stabilization Specifications

(REFER TO EROSION CONTROL PLAN FOR APPLICABLE AREAS)

MULCH: MATERIAL SHALL CONSIST OF ANY STRAW, HAY, WOOD EXCELSIOR FIBER OR OTHER SUITABLE MATERIAL OF A SIMILAR NATURE WHICH IS SUBSTANTIALLY FREE OF NOXIOUS WEED SEEDS AND OBJECTIONABLE FOREIGN MATTER. MULCH SHALL CONFORM TO WDNR TECHNICAL STANDARD 1058.

STANDARD BIODEGRADABLE MAT: CLASS 1, TYPE A, AS LISTED IN THE LATEST EDITION OF THE WIS. DOT EROSION CONTROL P.A.L. PRODUCTS WITH UV DEGRADABLE NETTING SHALL NOT BE INSTALLED AFTER SEPTEMBER 1ST. TYPE B MAT MAY BE USED IN REPLACEMENT FOR TYPE A MAT AT THE OPTION OF THE CONTRACTOR WITH NO ADDITIONAL COST TO THE OWNER. EROSION MAT SHALL ALSO MEET THE REQUIREMENTS OF WDNR TECHNICAL STANDARD 1053.

HIGH VELOCITY EROSION MAT: CLASS 1, TYPE B, AS LISTED IN THE LATEST EDITION OF THE WIS. DOT EROSION CONTROL P.A.L. PRODUCTS WITH UV DEGRADABLE NETTING SHALL NOT BE INSTALLED AFTER SEPTEMBER 1ST. EROSION MAT SHALL ALSO MEET THE REQUIREMENTS OF WDNR TECHNICAL STANDARD 1053.

STAPLES: USE U-SHAPED STAPLES NO. 11 GAUGE OR HEAVIER STEEL WIRE OR OTHER APPROVED MATERIALS, WITH A WIDTH OF ONE TO TWO INCHES, AND A LENGTH NOT LESS THAN 6 INCHES FOR FIRM SOILS AND NOT LESS THAN 12 INCHES FOR LOOSE SOILS.

INSTALLATION: ALL EROSION MATTING SHALL BE INSTALLED WITH DOWNSLOPE EDGE BURIED OR OVERLAPPED A MINIMUM OF 3 INCHES BY UPSLOPE MATTING TO PREVENT UNDERFLOWS.

RIP-RAP : 4-12" ROCK, 50% > 6", 10-20% < 2" (OVER 8 OZ. GEOTEXTILE) DECORATIVE STONE MAY BE USED AS LONG AS IT MEETS SPECIFICATIONS.

WIS DOT Standard Specifications
Section 630
Permanent Seed Mixtures

SPECIES	% MINIMUM PURITY	% MINIMUM GERMINATION	MIXTURE PROPORTIONS in percent			
			NO. 10	NO. 20	NO. 30	NO. 40
KENTUCKY BLUEGRASS	98	85	40	6	10	35
RED FESCUE	97	85	25		30	20
HARD FESCUE	97	85		24	25	20
TALL FESCUE	98	85		40		
SALT GRASS	98	85			10	
REDTOP	92	85	5			
PERENNIAL RYEGRASS	97	90	20	30		
IMPROVED FINE PERENNIAL RYEGRASS	96	85			15	25
WHITE CLOVER	95	90	10			
BIRDSFOOT TREFOIL	95	80			10	

1. USE SEED MIXTURE NO. 10 WHERE AVERAGE LOAM, HEAVY CLAY, OR MOIST SOILS PREDOMINATE.
2. USE SEED MIXTURE NO. 20 WHERE LIGHT, DRY, WELL-DRAINED, SANDY, OR GRAVELLY SOILS PREDOMINATE AND FOR ALL HIGH CUT AND FILL SLOPES GENERALLY EXCEEDING 6 TO 8 FEET (1.8 TO 2.4 m).
3. USE SEED MIXTURE NO. 10 OR NO. 20 ON ALL DITCHES, INSLOPES, MEDIAN AREAS, AND LOW FILLS, EXCEPT WHERE USING NO. 30.
4. USE SEED MIXTURE NO. 30 FOR MEDIANS AND ON SLOPES OR DITCHES GENERALLY WITHIN 15 FEET (4.5 m) OF THE SHOULDER WHERE A SALT-TOLERANT TURF IS PREFERRED.
5. USE SEED MIXTURE NO. 40 IN URBAN OR OTHER AREAS WHERE A LAWN TYPE TURF IS PREFERRED.

USE THE FOLLOWING SOWING RATE FOR SEEDS IN POUNDS (kg) PER 1000 SQUARE FEET (100 SQUARE METERS) OF AREA:

- SEED MIXTURE NO. 10 AT 1.5 POUNDS (0.7 kg)
- SEED MIXTURE NO. 20 AT 3.0 POUNDS (1.5 kg)
- SEED MIXTURE NO. 30 AT 2.0 POUNDS (1.0 kg)
- SEED MIXTURE NO. 40 AT 2.0 POUNDS (1.0 kg)

Procedures of Construction

BASED ON A 90 DAY SCHEDULE
ANTICIPATED START : APRIL 1, 2020

1. INSTALL EROSION CONTROL MEASURES PER PLAN. (COMPLETED DAY 1)
2. BLAST AND REMOVE BEDROCK FOR UTILITES, STORM PONDS AND FINAL GRADING. (COMPLETED DAY 10)
3. WET PONDS A, B1, B2, AND C: EXCAVATE AND GRADE STORM PONDS. INSTALL LINERS AND OUTLET STRUCTURES. (COMPLETED DAY 20)
4. UTILIZE WET PONDS A, B1, B2, AND C AS SEDIMENT BASINS DURING CONSTRUCTION.
5. INSTALL SEWER, WATER, CULVERTS & UTILITIES. (COMPLETED DAY 30)
6. GRADE SITE TO SUB GRADE. (COMPLETED DAY 40)
7. PLACE GRAVEL IN ROADS AND PARKING LOTS. (COMPLETED DAY 55)
8. TOPSOIL, SEED, FERTILIZE AND MULCH ALL DISTURBED AREAS. (COMPLETED DAY 70)
9. INSTALL STABILIZATION MEASURES (EROSION NETTING/MATTING PER PLAN). (COMPLETED DAY 70)
10. INSTALL BINDER COURSE ON ROAD AND PARKING LOTS AND CURB AND GUTTER. (COMPLETED DAY 90)
11. EXCAVATE SEDIMENT FROM CONSTRUCTION SITE RUNOFF OUT OF STORM PONDS TO MATCH PLAN GRADE AFTER AT LEAST 75% OF THE PERMANENT VEGETATION HAS BEEN ESTABLISHED. (AS NEEDED)
12. VERIFY ENGINEERED MEDIA IN BASE OF BIO-DETENTION POND B2 INFILTRATES PER DESIGN. REMOVE ANY SEDIMENT AND REMEDIATE MEDIA AS NEEDED. MINIMAL COMPACTION REQUIRED. PLANT PER PLAN AFTER SITE HAS STABILIZED. (AS NEEDED)
13. TOPSOIL, SEED, FERTILIZE AND MULCH ALL REDISTURBED AREAS.
14. REMOVE EROSION CONTROL MEASURES AFTER VEGETATION HAS BEEN WELL ESTABLISHED.

Site Dewatering

(IF NEEDED – NOT ANTICIPATED)

1. DEWATERING FOR POND & UTILITY CONSTRUCTION SHALL CONFORM TO REQUIREMENTS SET FORTH IN WDNR TECHNICAL STANDARD 1061.
2. THE CONTRACTOR HAS THE OPTION TO UTILIZE WDNR APPROVED METHODS INCLUDING:
   - GEOTEXTILE BAGS (SEE TECHNICAL STANDARD 1061)
   - SEDIMENT TRAPS (SEE TECHNICAL STANDARD 1063)
   - SEDIMENT BASINS (SEE TECHNICAL STANDARD 1064)
3. CONTRACTOR HAS OPTION TO UTILIZE STORM PONDS CONSTRUCTED ON THIS SITE AS SEDIMENT BASINS FOR DEWATERING.
4. CONTRACTOR SHALL LIMIT PUMP RATE TO BE LESS THAN 70 G.P.M. TO PREVENT NEED FOR WDNR WELL PERMIT.
5. IN NO EVENT SHALL UNTREATED DISCHARGE BE ALLOWED TO FLOW DIRECTLY INTO WETLANDS OR WATERWAYS.

Temporary Seeding

SPECIES	% MINIMUM PURITY	% MINIMUM GERMINATION
ANNUAL OATS	98	90
AGRICULTURAL RYE	97	85
WINTER WHEAT	95	90
ANNUAL RYEGRASS	97	90

1. USE OATS IN SPRING AND SUMMER PLANTINGS.
2. USE WINTER WHEAT OR RYE FOR FALL PLANTINGS STARTED AFTER SEPTEMBER 1.
3. APPLY TEMPORARY SEEDING AT 3 POUNDS PER 1000 SQUARE FEET OF AREA, EXCEPT ANNUAL RYEGRASS WHICH MAY BE APPLIED AT 2 POUNDS PER 1000 SQUARE FEET OF AREA.

Wet Seed Mix

(IN BASE OF BIO-DETENTION PONDS)

Prairie Seed Mixture
CREP Wet Site Mix
(To be used in flood prone areas)

Species	Plant Type	PLS oz/acre
Prairie Cordgrass	Grass	2.0
Rice Cutgrass	Grass	2.0
Switchgrass	Grass	8.0
Virginia Wild Rye	Grass	16.0
Woolgrass	Sedge	1.0
Fox Sedge	Sedge	2.0
Great St. Johns Wort	Forb	1.0
Marsh Milkweed	Forb	2.0
Sneezeweed	Forb	1.0
Joe-Pye Weed	Forb	2.0
Blue Vervain	Forb	2.0

(OR EQUIVALENT)

NOTE:
OWNER HAS OPTION TO PLANT STANDARD GRASS IN BASE OF BIO-DENTENTION PONDS IF PRAIRIE LOOK IS NOT DESIRED. RE-PLANTING OF THESE AREAS USING WET MIX MAY BE NECESSARY IF GRASS CANNOT BE MAINTAINED.

Storm Drain Inlet Protection Detail

NO SCALE

INLET PROTECTION, TYPE A

INLET PROTECTION, TYPE B
(WITHOUT CURB BOX)
(CAN BE INSTALLED IN ANY INLET WITHOUT A CURB BOX)

INLET PROTECTION, TYPE C (WITH CURB BOX)

INLET PROTECTION, TYPE D
(CAN BE INSTALLED IN ANY INLET TYPE WITH OR WITHOUT A CURB BOX AS PER NOTE ②)

GENERAL NOTES

MANUFACTURED ALTERNATIVES APPROVED AND LISTED ON THE WISCONSIN DOT EROSION CONTROL PRODUCT ACCEPTABILITY LIST MAY BE SUBSTITUTED.

WHEN REMOVING OR MAINTAINING INLET PROTECTION, CARE SHALL BE TAKEN SO THAT THE SEDIMENT TRAPPED ON THE GEOTEXTILE FABRIC DOES NOT FALL INTO THE INLET. ANY MATERIAL FALLING INTO THE INLET SHALL BE REMOVED IMMEDIATELY.

1 ① FINISHED SIZE, INCLUDING FLAP POCKETS WHERE REQUIRED, SHALL EXTEND A MINIMUM OF 10" AROUND THE PERIMETER TO FACILITATE MAINTENANCE OR REMOVAL.

② FOR INLET PROTECTION, TYPE C (WITH CURB BOX), AN ADDITIONAL 18" OF FABRIC IS WRAPPED AROUND THE WOOD AND SECURED WITH STAPLES. THE WOOD SHALL NOT BLOCK THE ENTIRE HEIGHT OF THE CURB BOX OPENING.

③ FLAP POCKETS SHALL BE LARGE ENOUGH TO ACCEPT WOOD 2X4.

INSTALLATION NOTES

TYPE B & C

TRIM EXCESS FABRIC IN THE FLOW LINE TO WITHIN 3" OF THE GRATE.

THE CONTRACTOR SHALL DEMONSTRATE A METHOD OF MAINTENANCE, USING A SEWN FLAP, HAND HOLDS OR OTHER METHOD TO PREVENT ACCUMULATED SEDIMENT FROM ENTERING THE INLET.

TYPE D

DO NOT INSTALL INLET PROTECTION TYPE D IN INLETS SHALLOWER THAN 30", MEASURED FROM THE BOTTOM OF THE INLET TO THE TOP OF THE GRATE.

TRIM EXCESS FABRIC IN THE FLOW LINE TO WITHIN 3" OF THE GRATE.

THE INSTALLED BAG SHALL HAVE A MINIMUM SIDE CLEARANCE, BETWEEN THE INLET WALLS AND THE BAG, MEASURED AT THE BOTTOM OF THE OVERFLOW HOLES, OF 3". WHERE NECESSARY THE CONTRACTOR SHALL CINCH THE BAG, USING PLASTIC ZIP TIES, TO ACHIEVE THE 3" CLEARANCE. THE TIES SHALL BE PLACED AT A MAXIMUM OF 4" FROM THE BOTTOM OF THE BAG.

This drawing based on Wisconsin Department of Transportation Standard Detail Drawing 8 E 10-2.

NOTE:
INLET PROTECTION SHALL CONFORM TO WDNR TECHNICAL STANDARD 1060.

CONTRACTOR IS RESPONSIBLE FOR MAINTENANCE AND DOCUMENTATION OF EROSION CONTROL MEASURES THROUGHOUT CONSTRUCTION PHASE. OWNER IS RESPONSIBLE FOR MAINTENANCE AFTER CONTRACTOR LEAVES THE SITE.

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DEC 04 2019
LAND USE SERVICES DEPARTMENT

DRAWN BY: RMB
DESIGNED BY: P.J.H.
DATE: 8-1-19
JOB NUMBER: 22061
PROJECT DIRECTORY:
PATH: Dreutzer-Goetz 22061\dwg
PLAN NAME: 061-DES
REVISED DATE: 12-3-19
SCALE: AS NOTED

BAUDHUIN SURVEYING & ENGINEERING
312 N. 5TH AVE.
P.O. BOX 105
STURGEON BAY, WI.
54235
PHONE: 920-743-8211

Quarry Bluff

CONSTRUCTION DETAILS

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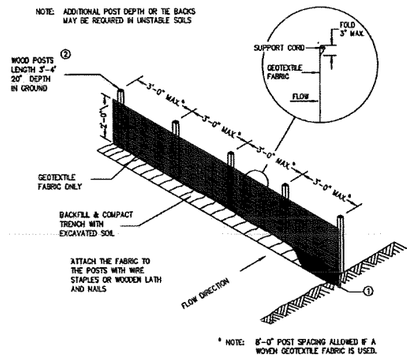
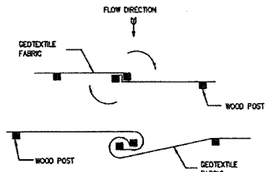
C200

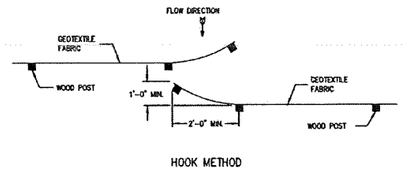
Silt Fence Detail
NO SCALE



SILT FENCE

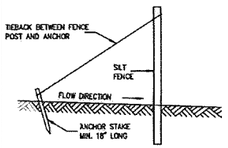


TWIST METHOD

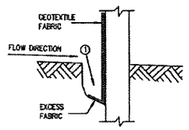


HOOK METHOD

JOINING TWO LENGTHS OF SILT FENCE ③



SILT FENCE TIE BACK
(WHEN ADDITIONAL SUPPORT REQUIRED)

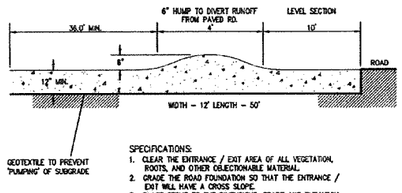


TRENCH DETAIL

GENERAL NOTES

1. TRENCH SHALL BE A MINIMUM OF 4" WIDE & 6" DEEP TO BURY AND ANCHOR THE GEOTEXTILE FABRIC. FOLD MATERIAL TO FIT TRENCH AND BACKFILL & COMPACT TRENCH WITH EXCAVATED SOIL.
2. WOOD POSTS SHALL BE A MINIMUM SIZE OF 1-1/8" x 1-1/8" OF OAK OR HICKORY.
3. CONSTRUCT SILT FENCE FROM A CONTINUOUS ROLL IF POSSIBLE BY CUTTING LENGTHS TO AVOID JOINTS. IF A JOINT IS NECESSARY USE ONE OF THE FOLLOWING TWO METHODS; A) OVERLAP THE END POSTS AND TWIST, OR ROTATE, AT LEAST 180 DEGREES, B) HOOK THE END OF EACH SILT FENCE LENGTH.
4. SILT FENCE SHALL CONFORM TO WDNR TECHNICAL STANDARD 1056.

Temporary Stone Tracking Pad Detail
NO SCALE



SPECIFICATIONS:
1. CLEAR THE ENTRANCE / EXIT AREA OF ALL VEGETATION, ROOTS, AND OTHER OBJECTIONABLE MATERIAL.
2. GRADE THE ROAD FOUNDATION SO THAT THE ENTRANCE / EXIT WILL HAVE A CROSS SLOPE.
3. PLACE STONE TO THE DIMENSIONS, GRADE AND ELEVATION SHOWN.
4. USE WASHED STONE 3" TO 6" IN SIZE.
5. DO NOT COMPACT AGGREGATE.

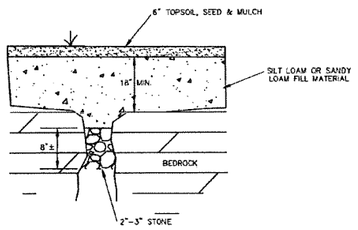
NOTE:
- MAINTAIN THE STONE PAD IN A CONDITION TO PREVENT MUD OR SEDIMENT FROM LEAVING THE SITE.
- MUD OR SEDIMENT THAT IS TRACKED OR WASHED ONTO ROAD MUST BE REMOVED IMMEDIATELY.
- TRACKOUT PAD SHALL CONFORM TO WDNR TECHNICAL STANDARD 1057.

Rock Hole / Crevice Patch Details
NO SCALE

REQUIRED ONLY IF ROCK HOLE ENCOUNTERED WITHIN BASE OF STORM POND AND UNTILITY TRENCHES WHERE BLASTING AND REMOVAL OF BEDROCK IS REQUIRED.

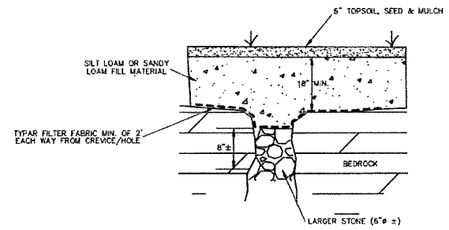
OPTION #1

(IF HOLE/CREVICE IS LESS THAN 4" WIDE)

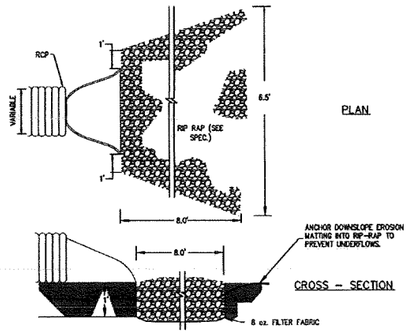


OPTION #2

(IF HOLE/CREVICE IS GREATER THAN 4" WIDE)

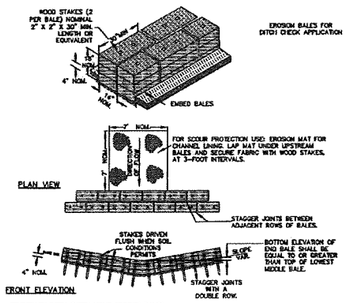


Culvert Rip-rap Detail
NO SCALE



(ALL DOWNSLOPE ENDS OF CULVERTS)

Channel Bale Check Detail
NO SCALE



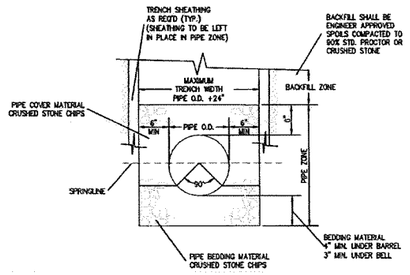
NOTES
1. INSTALLATION OF EROSION BALES / TEMPORARY DITCH CHECKS SHALL CONFORM TO WDNR TECHNICAL STANDARD 1062.
2. MANUFACTURED ALTERNATIVES APPROVED AND LISTED ON THE WISDOT EROSION CONTROL P.A.L. MAY BE SUBSTITUTED

Wet Pond Liner
PER WET DETENTION POND DNR TECHNICAL STANDARD 1001
FOR WET PONDS ONLY (POND A AND B1)

TYPE B LINERS – FOR SITES WITH MEDIUM POTENTIAL FOR GROUNDWATER POLLUTION OR WHERE NEED FOR A FULL POOL LEVEL IS HIGH. THEY INCLUDE:
- ALL LINERS MEETING TYPE A CRITERIA
- CLAY
- HDPE
- POLY ETHYLENE POND LINER (PPL)

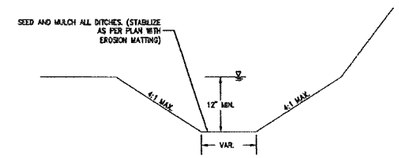
1. CLAY LINER CRITERIA:
   A. 50% FINES (200 SIEVE) OR MORE.
   B. AN IN-PLACE HYDRAULIC CONDUCTIVITY OF 1×10^{-6} CM./SEC. OR LESS.
   C. AVERAGE LIQUID LIMIT VALUE OF 16 OR GREATER, WITH NO VALUE LESS THAN 14.
   D. AVERAGE PI OF 7 OR MORE WITH NO VALUES LESS THAN 14.
   E. CLAY COMPACTION AND DOCUMENTATION AS SPECIFIED IN NRCS WISCONSIN CONSTRUCTION SPECIFICATION 204, EARTHFULL FOR WASTE STORAGE FACILITIES.
   F. MINIMUM THICKNESS OF TWO FEET.
   G. SPECIFY METHOD FOR KEEPING THE POOL FULL OR USE OF COMPOSITE SOILS BELOW LINER.
2. HDPE LINER CRITERIA:
   A. MINIMUM THICKNESS SHALL BE 40 MILS.
   B. ALL OTHER CRITERIA SAME AS FOR TYPE A HDPE LINER.
3. PPL LINER CRITERIA:
   A. MINIMUM THICKNESS SHALL BE 30 MILS.
   B. ALL OTHER CRITERIA SAME AS FOR TYPE A HDPE LINER.

Culvert & Stormsewer Bedding Detail
NO SCALE



NOTE: 3" OF ADDITIONAL CRUSHED STONE REQUIRED IN WET TRENCH AT NO ADDITIONAL COST.

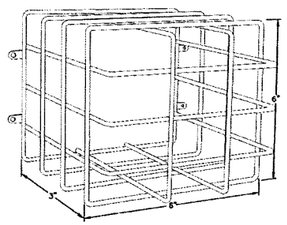
Swale Detail
NO SCALE



– MIN. LONGITUDINAL SLOPE = 0.75%

– WHERE SPECIFIED, EROSION MATTING, STAKED SOD OR RIP-RAP SHALL BE A MINIMUM OF 6' WIDE CENTERED IN THE SWALE

Anti-Clog Cage Detail
NO SCALE



SPECIFICATIONS:
- EXTEND 3" OUT FROM ORIFICE
- 1" MAX OPENINGS
- ATTACH CAGE TO CONCRETE RISER FACE USING MIN (4) 3/8" TAPCONS, OR SIM.
- DETAIL AS SHOWN ABOVE OR SIMILAR

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BAUDHUIN
SURVEYING & ENGINEERING
312 N. 5TH AVE.
P.O. BOX 105
STURGEON BAY, WI.
54235
PHONE: 920-743-6211

DRAWN BY: RMB
DESIGNED BY: PJH
DATE: 01-1-19
JOB NUMBER: 21061
PROJECT DIRECTORY PATH: S:\Arch_Dwg\
PATH: Directory-Dwg\ 2261\Dwg
PLOT SCALE: AS NOTED
PLOT DATE: 12-3-19
REVISED DATE:

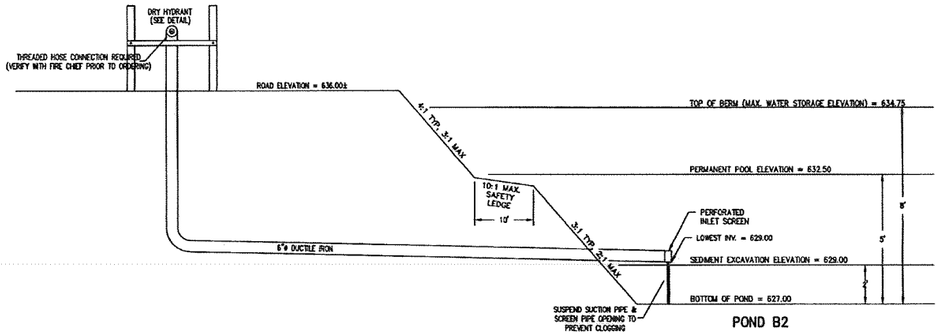
Quarry Bluff

CONSTRUCTION DETAILS

C201

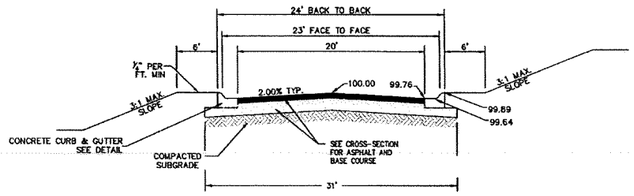
Dry Hydrant Suction Line Detail

NO SCALE



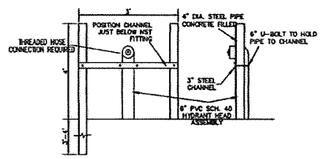
Curbed Street Section

NO SCALE



Dry Hydrant Detail

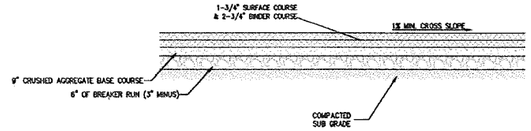
NO SCALE



NOTES:
-ELEVATION AND EXACT PLACEMENT TO BE REVIEWED WITH FIRE CHIEF PRIOR TO INSTALLATION.
- MATERIAL TO BE VERIFIED BY FIRE DEPARTMENT.

Road & Parking Lots Cross-Section

NO SCALE



NOTE:
THE ASPHALTIC BASE AND SURFACE COURSE SHOULD BE PLACED AND PROVIDED IN ACCORDANCE WITH SECTION 455/460 OF THE STATE OF WISCONSIN STANDARD SPECIFICATION FOR HIGHWAY AND STRUCTURE CONSTRUCTION. THE CRUSHED AGGREGATE BASE COURSE SHOULD BE PROVIDED AND PLACED IN ACCORDANCE WITH SECTION 301/305 OF THE STANDARD SPECIFICATION.

NOTE:

ALL BACK FILL IN EXISTING OR PROPOSED ROADS SHALL BE COMPACTED TO 95% STANDARD PROCTOR

BEDDING MATERIAL SHALL BE CRUSHED STONE CHIPS MEETING THE FOLLOWING GRADATION REQUIREMENTS:

SIEVE SIZES	PERCENTAGE PASSING BY WEIGHT
1-INCH	100
3/4 INCH	90-100
3/8 INCH	20-55
No. 4	0-10
No. 8	0-5

COVER MATERIAL SHALL CONSIST OF UNWASHED BANK-RUN SAND OR CRUSHED BANK-RUN GRAVEL. THIS MATERIAL SHALL SUBSTANTIALLY CONFORM TO THE TO THE FOLLOWING GRADATION REQUIREMENTS.

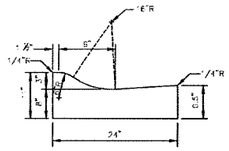
SIEVE SIZES	PERCENTAGE PASSING BY WEIGHT
1-INCH	100
3/4 INCH	85-100
3/8 INCH	50-60
No. 4	35-65
No. 40	15-30
No. 200	5-15

GRANULAR MATERIAL SHALL CONSIST OF UNIFORM GRADED DURABLE PARTICLES. SUFFICIENT FINE MATERIAL SHALL BE PRESENT TO FILL ALL THE VOIDS OF THE COURSE MATERIAL. SOME FINE CLAY OR LOAM PARTICLES ARE DESIRABLE, BUT THEY SHALL NOT BE PRESENT IN THE FORM OF LUMPS. GRANULAR BACK FILL SHALL CONFORM TO THE FOLLOWING GRADATION REQUIREMENTS:

SIEVE SIZES	PERCENTAGE PASSING BY WEIGHT
2-INCH	95-100
No. 4	65-60
Finer than No. 200	35-65

Concrete Curb and Gutter

NO SCALE



Mountable Concrete Curb & Gutter
(THROUGHOUT DEVELOPMENT)

NOTE:
TEMPORARY ASPHALT WEDGING REQUIRED UNTIL FINAL LIFT OF ASPHALT IS INSTALLED.

CRUSHED STONE BASE IS REQUIRED UNDER CURB & GUTTER. DEPTH OF THE CRUSHED STONE BASE SHALL MATCH ADJACENT PAVEMENT CRUSHED STONE BASE.

RECEIVED
DEC 04 2018
[illegible] DEPARTMENT

DRAWN BY: RMB
DESIGNED BY: P.J.H.
DATE: 9-11-18
JOB NUMBER: 22061
PROJECT DIRECTORY:
PLAN: Shooter Road 2018\Dwg\ 061-PLS
PLOT DATE: 12-3-18
REVISED DATE:
SCALE: AS NOTED

BAUDHUIN
312 N. 5TH AVE.
P.O. BOX 105
STURGEON BAY, WI. 54235
PHONE: 920-743-6211
SURVEYING & ENGINEERING

Quarry Bluff

CONSTRUCTION DETAILS

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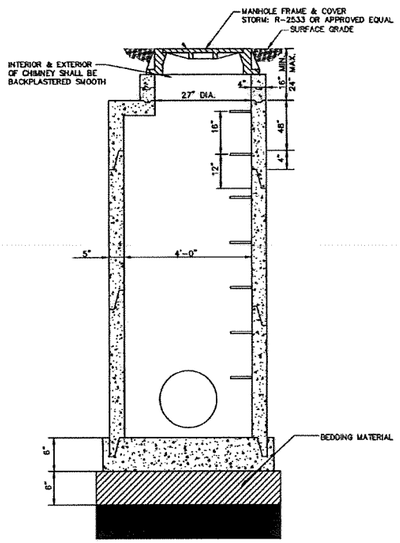
C202

Standard Precast Storm Manhole

NO SCALE



Notes

FLAT TOP DECK MAY BE USED FOR 5'-0" AND 6'-0" DIAMETER MAN HOLES.

PRECAST CONCRETE ADJUSTING RINGS TO BE REINFORCED WITH ONE HOOP OF STEEL CENTERED WITHIN THE RING. WHERE NECESSARY, RINGS CAST SHALL BE GROOVED TO RECEIVE STEP.

CONCRETE AND STEEL REINFORCEMENT SHALL CONFORM TO DESIGNATION C-478 REQUIREMENTS OF ASTM SPECIFICATIONS.

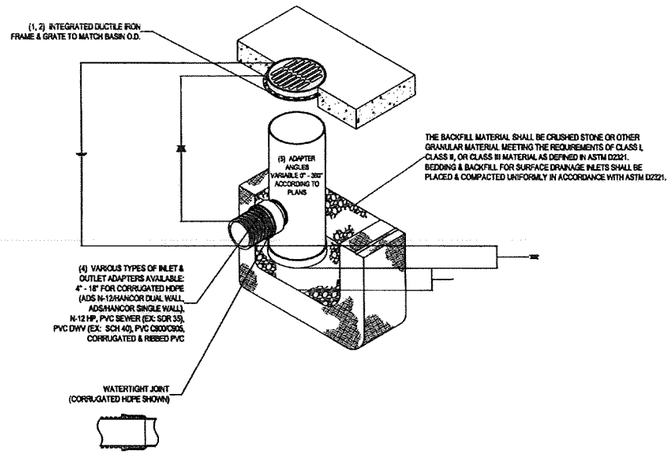
JOINTS SHALL BE WATERTIGHT AND SHALL BE MADE USING RUBBER GASKETS OR BUTYL RUBBER MASTIC MATERIAL AREA OF CIRCUMFERENTIAL STEEL = .12 SQ. INCH PER LINEAL FOOT

6" OF BEDDING MATERIAL REQUIRED UNDER BASE. MANHOLES TO BE BACKFILLED WITH GRANULAR BACKFILL MATERIAL.

24" Yard Drain Detail

Use Nyloplast Drain Basin or approved equal

NO SCALE

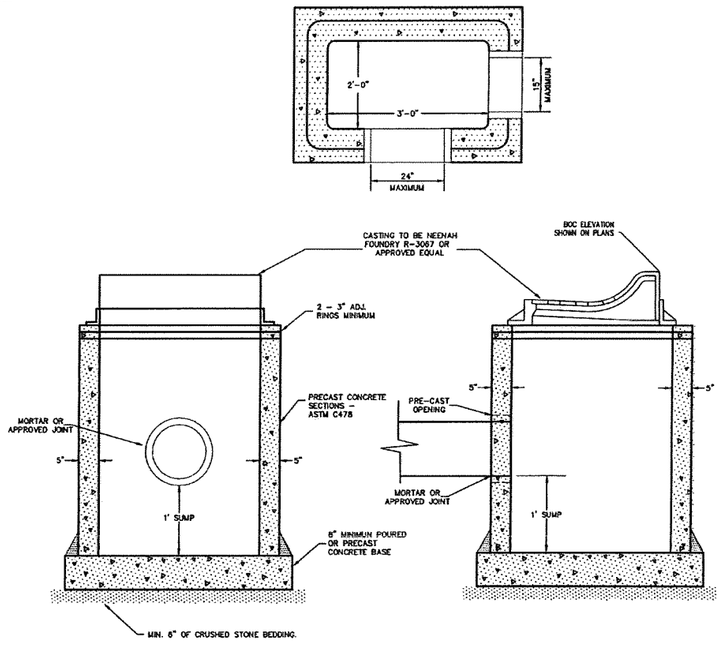


1 - GRATES/SOLID COVER SHALL BE DUCTILE IRON PER ASTM A536 GRADE 70-50-05.
2 - FRAMES SHALL BE DUCTILE IRON PER ASTM A536 GRADE 70-50-05.
3 - DRAIN BASIN TO BE CUSTOM MANUFACTURED ACCORDING TO PLAN DETAILS. RISERS ARE NEEDED FOR BASINS OVER 84" DUE TO SHIPPING RESTRICTIONS. SEE DRAWING NO. 7001-110-006.
4 - DRAINAGE CONNECTION STUB JOINT TIGHTNESS SHALL CONFORM TO ASTM D3212 FOR CORRUGATED HDPE (ADS N-12/HANCOR DUAL WALL), N-12 HP, & PVC SEWER.
5 - ADAPTERS CAN BE MOUNTED ON ANY ANGLE 0° TO 360°. TO DETERMINE MINIMUM ANGLE BETWEEN ADAPTERS SEE DRAWING NO. 7001-110-012.

GRATE OPTIONS	LOAD RATING	PART #	DRAWING #
PEDESTRIAN	MEETS H-10	1880COP	7001-110-212
STANDARD	MEETS H-20	1880CGR	7001-110-213
SOLID COVER	MEETS H-20	1880COC	7001-110-214
DOME	N/A	1880CGD	7001-110-215
DROP IN GRATE	LIGHT DUTY	1801DI	7001-110-074

Catch Basin

NO SCALE



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312 N. 5TH AVE.
P.O. BOX 105
STURGEON BAY, WI.
54235
PHONE: 920-743-8211

DRAWN BY: RJB
PROJECT DIRECTORY:
PLAN: Downtown-Quarry 22001.dwg
PLAN NAME: 7001-110-215
REVISED DATE: 12-3-19
DATE: 12-3-19
JOB NUMBER: 22001
SCALE: AS NOTED

Quarry Bluff

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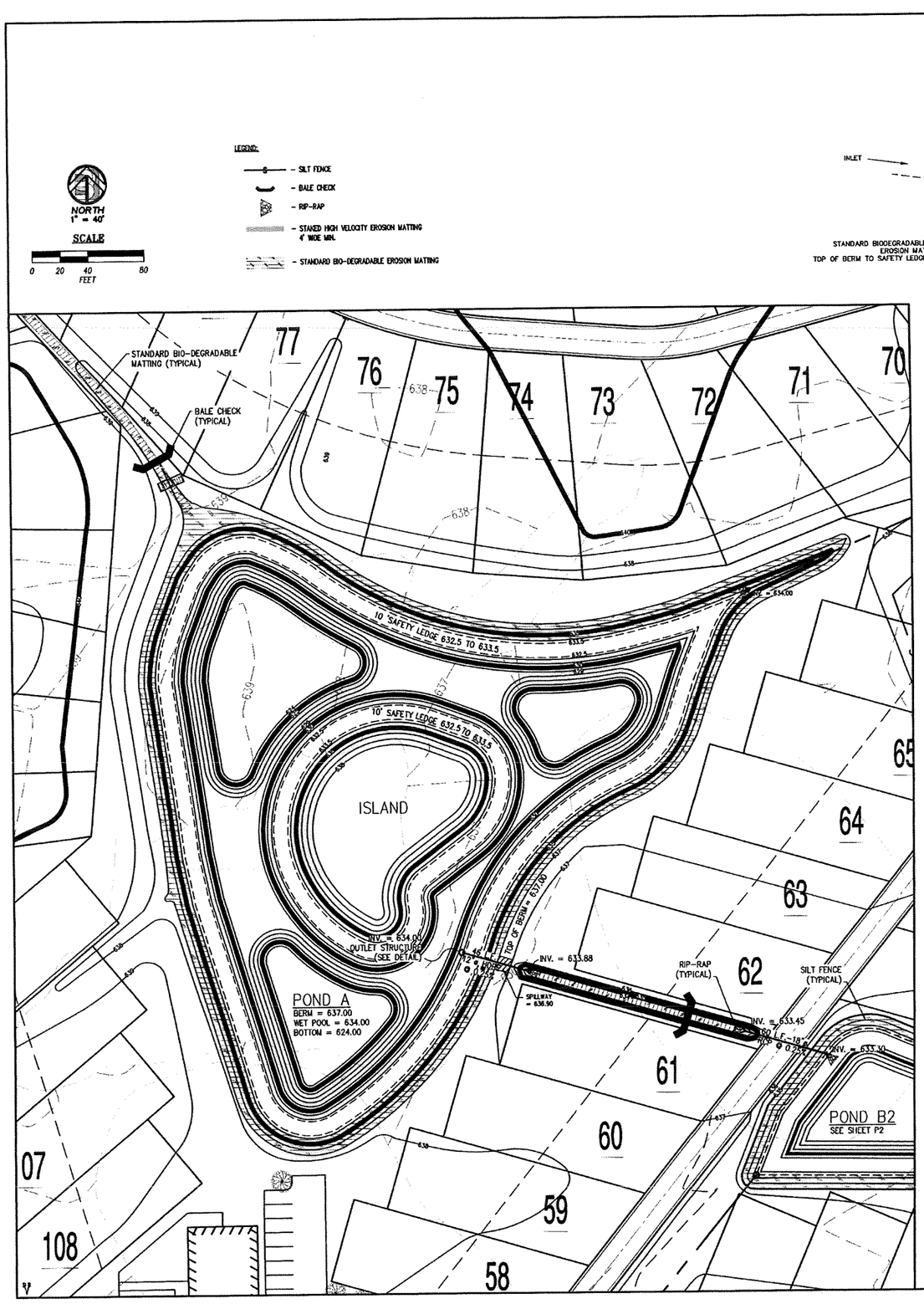
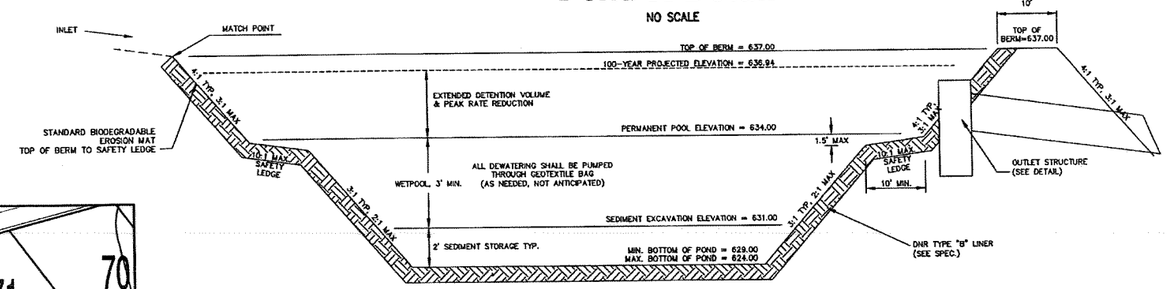
C203



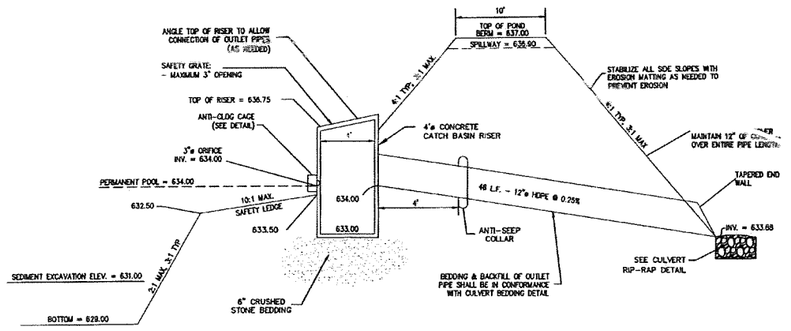
Pond A Detail

NO SCALE



Pond A Outlet Structure Detail

NO SCALE



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LAND USE SERVICES DEPARTMENT

BAUDHUIN SURVEYING & ENGINEERING
312 N. 5TH AVE.
P.O. BOX 105
STURGEON BAY, WI. 54235
PHONE: 920-743-8211

PATH: Drwatter-Cadd 2006\dwg
PLAN NAME: 061-DES
PROJECT DIRECTORY: V:\dwg\dwg\
REVISED DATE: 12-3-19
SCALE: AS NOTED
DRAWN BY: RMB
DESIGNED BY: P.J.H.
DATE: 8-1-19
JOB NUMBER: 22061

Quarry Bluff

POND A DETAILS

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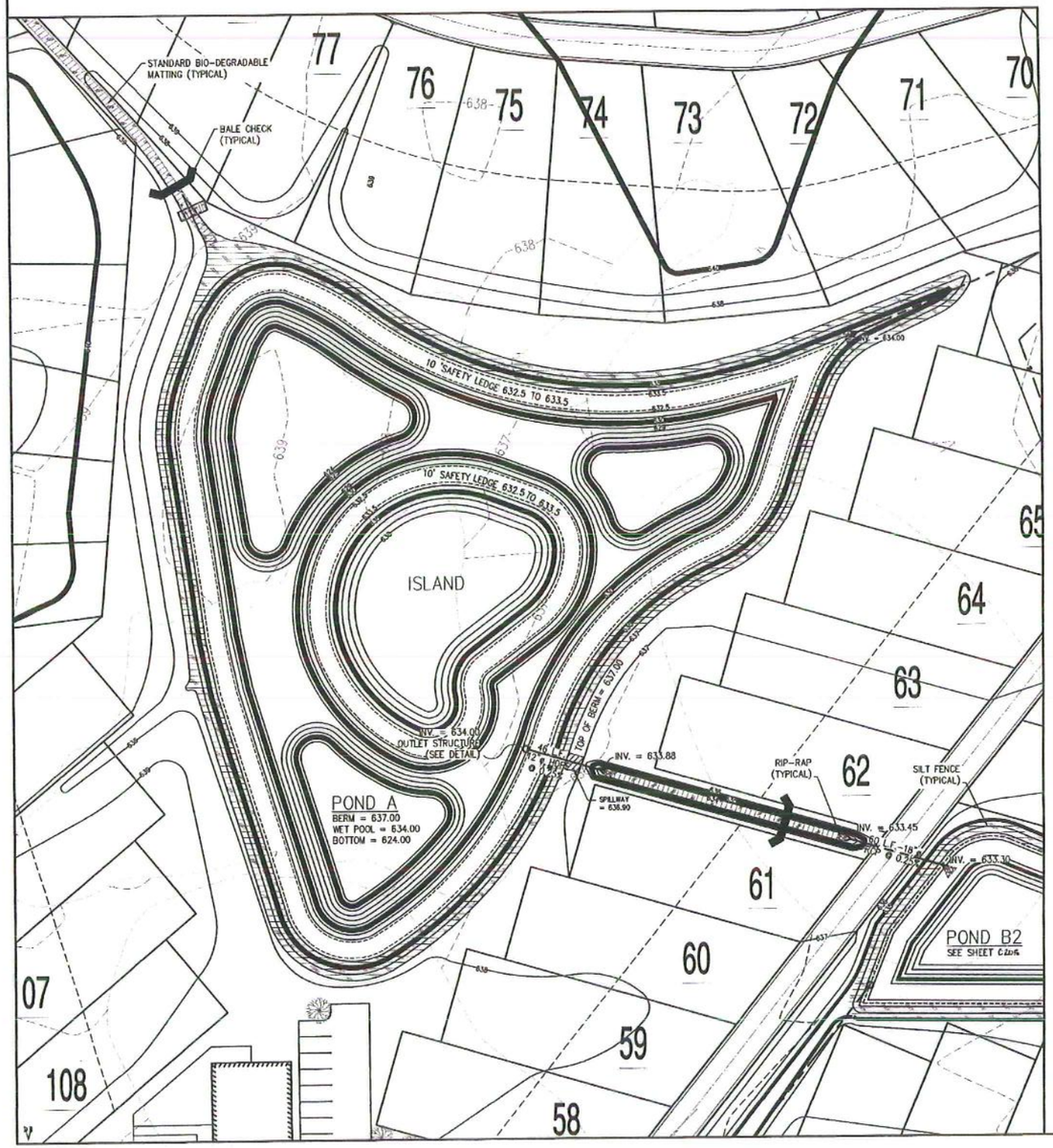
C204

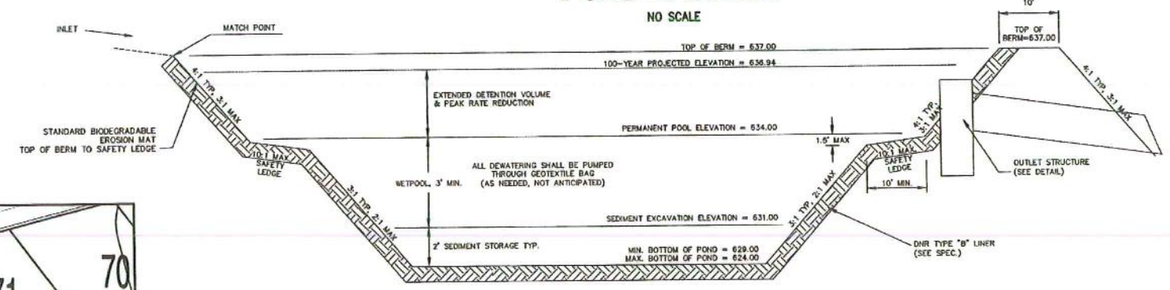
NORTH
1" = 40'

SCALE
0 20 40 80
FEET

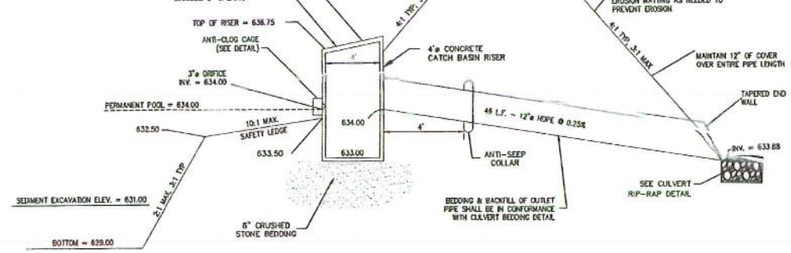
LEGEND:
- SILT FENCE
- BALE CHECK
- RIP-RAP
- STAKED HIGH VELOCITY EROSION MATTING 4' WIDE MIN.
- STANDARD BIO-DEGRADABLE EROSION MATTING



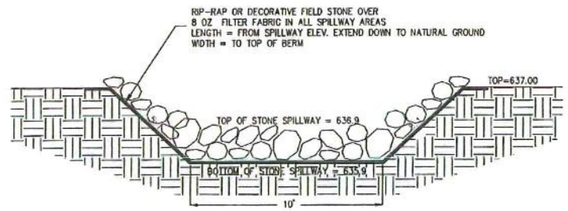
Pond A Detail
NO SCALE



Pond A Outlet Structure Detail
NO SCALE



Pond A Spillway Detail
NO SCALE



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LAND USE SERVICES DEPARTMENT

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312 N. 5TH AVE.
P.O. BOX 105
STURGEON BAY, WI.
54235
PHONE: 920-743-6211
SURVEYING & ENGINEERING

PLOT: Structur-Cont: 2061dwg
PLAN #####: C01-DEC
PROJECT DIRECTORY
REVISED DATE: 12-5-19
DRAWN BY: RMG
DESIGNED BY: JAK
DATE: 8-1-19
JOB NUMBER: 2061
SCALE: AS STATED

Quarry Bluff

POND A DETAILS

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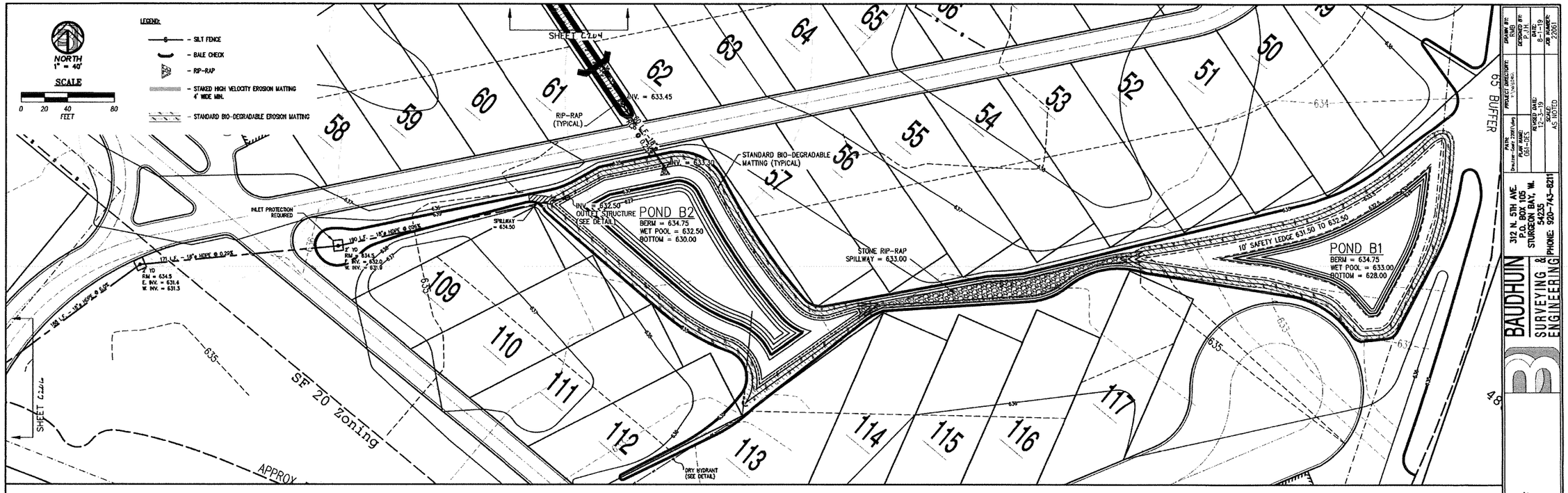
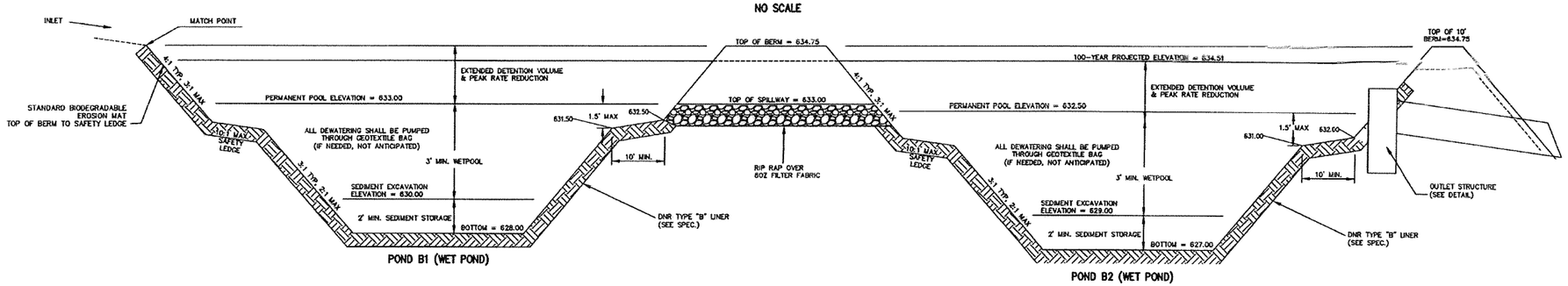
C204



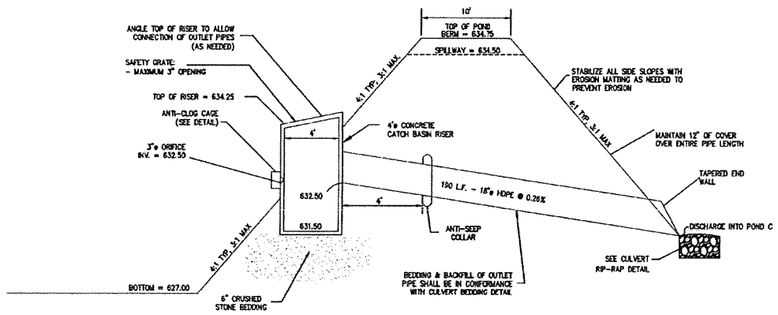
Pond B Detail

NO SCALE



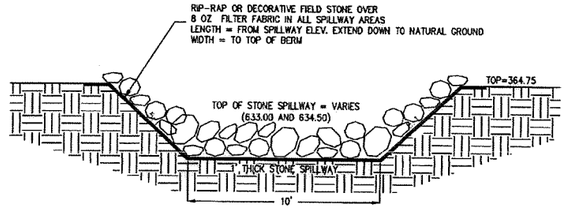
Pond B Outlet Structure Detail

NO SCALE



Pond B Spillway Detail

NO SCALE



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SURVEYING & ENGINEERING
312 N. 5TH AVE.
P.O. BOX 105
STURGEON BAY, WI.
54235
PHONE 920-743-8211

DRAWING BY: RMB
DESIGNED BY: P.J.H.
DATE: 8-19
JOB NUMBER: 22061
PROJECT DIRECTORY:
PATH: Drawings/Quarry Bluff/Sheets/C205
DATE: 08-19
REVISED DATE: 12-19
SCALE: AS NOTED

Quarry Bluff

POND B DETAILS

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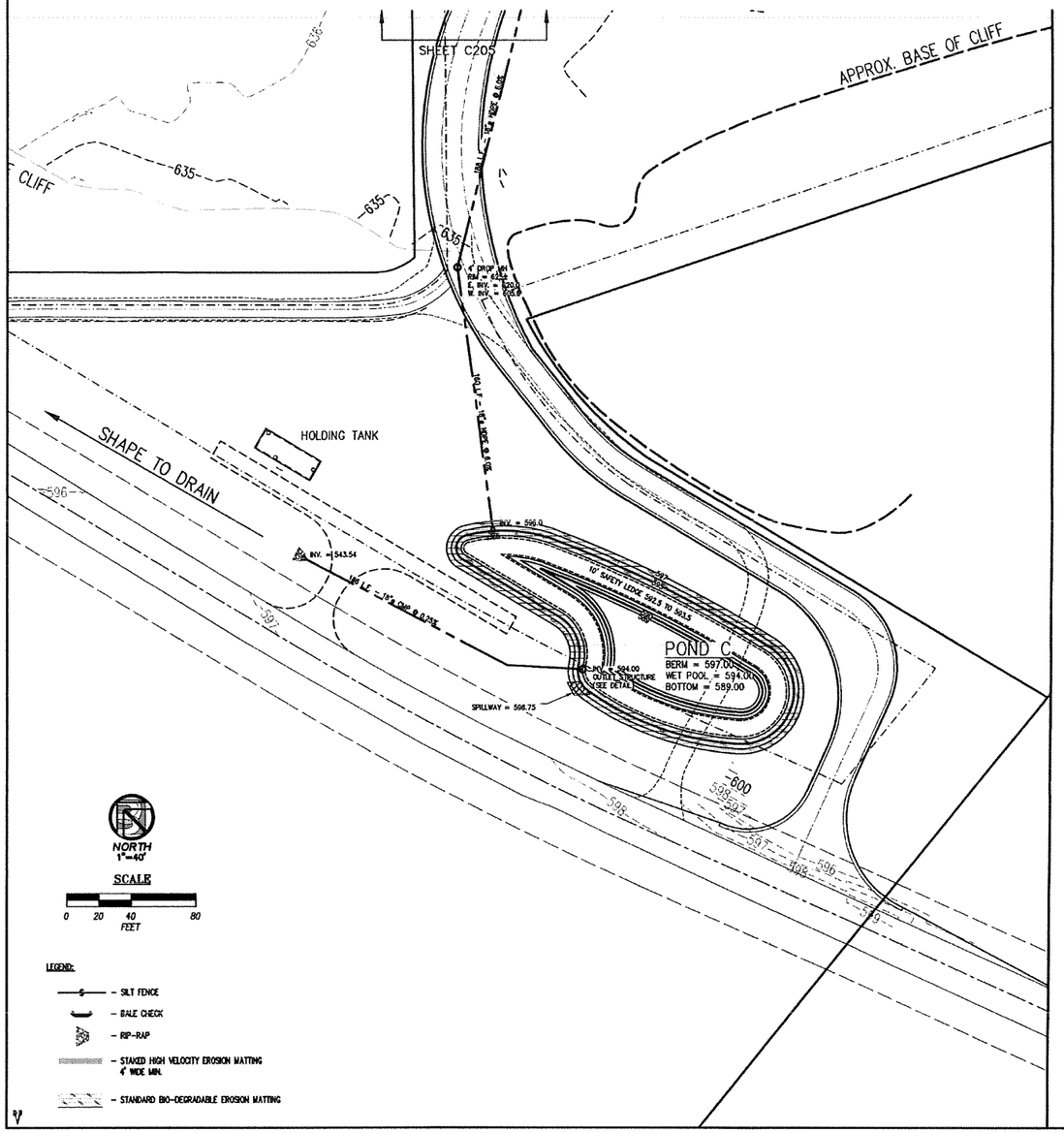
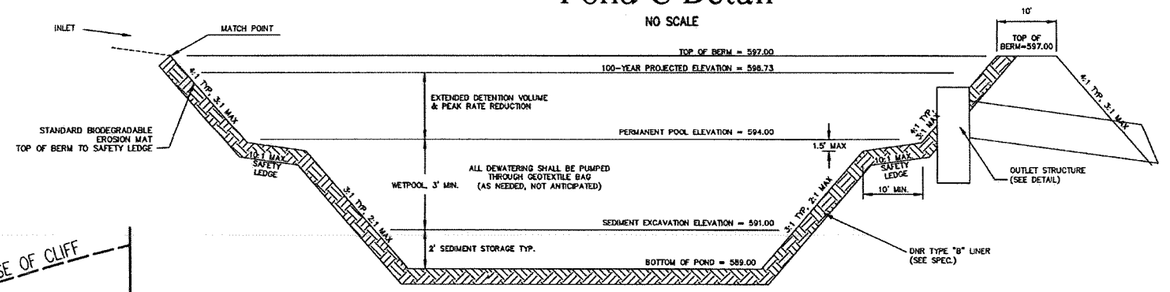
C205



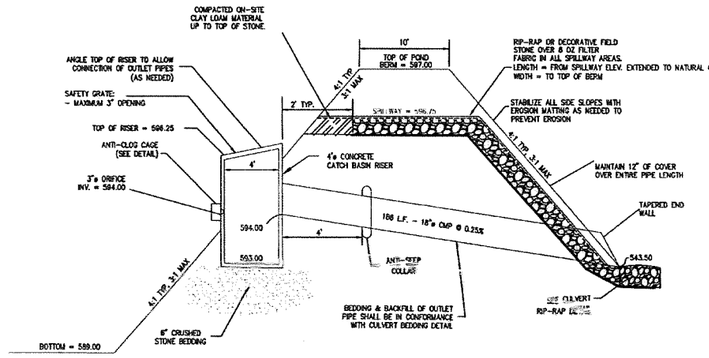
Pond C Detail

NO SCALE



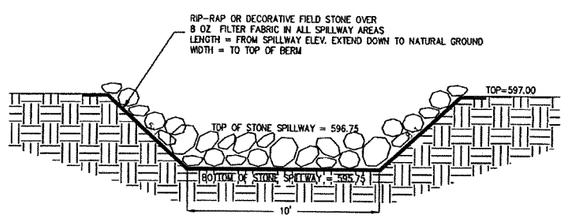
Pond C Outlet Structure Detail

NO SCALE



Pond C Spillway Detail

NO SCALE



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LAND USE SERVICES DEPARTMENT

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312 N. 5TH AVE.
P.O. BOX 105
STURGEON BAY, WI.
54235
PHONE: 920-743-6211

PATH: Drive:\me-Exact 2009\Dwg
PLAN NAME: 2061-QUAR.dwg
PROJECT DIRECTORY: S:\MAINTAIN\
REVISED DATE: 12-3-19
PLOT SCALE: AS NOTED
DRAWN BY: RMB
DESIGNED BY: R.M.B.
DATE: 6-11-19
JOB NUMBER: 2061

Quarry Bluff

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C206