ATTACHMENT 7

PRELIMINARY NOT FOR CONSTRUCTION

Stream Restoration Outline (See Sheet 2 for Detailed Descriptions of Work)

A. Tributary 111

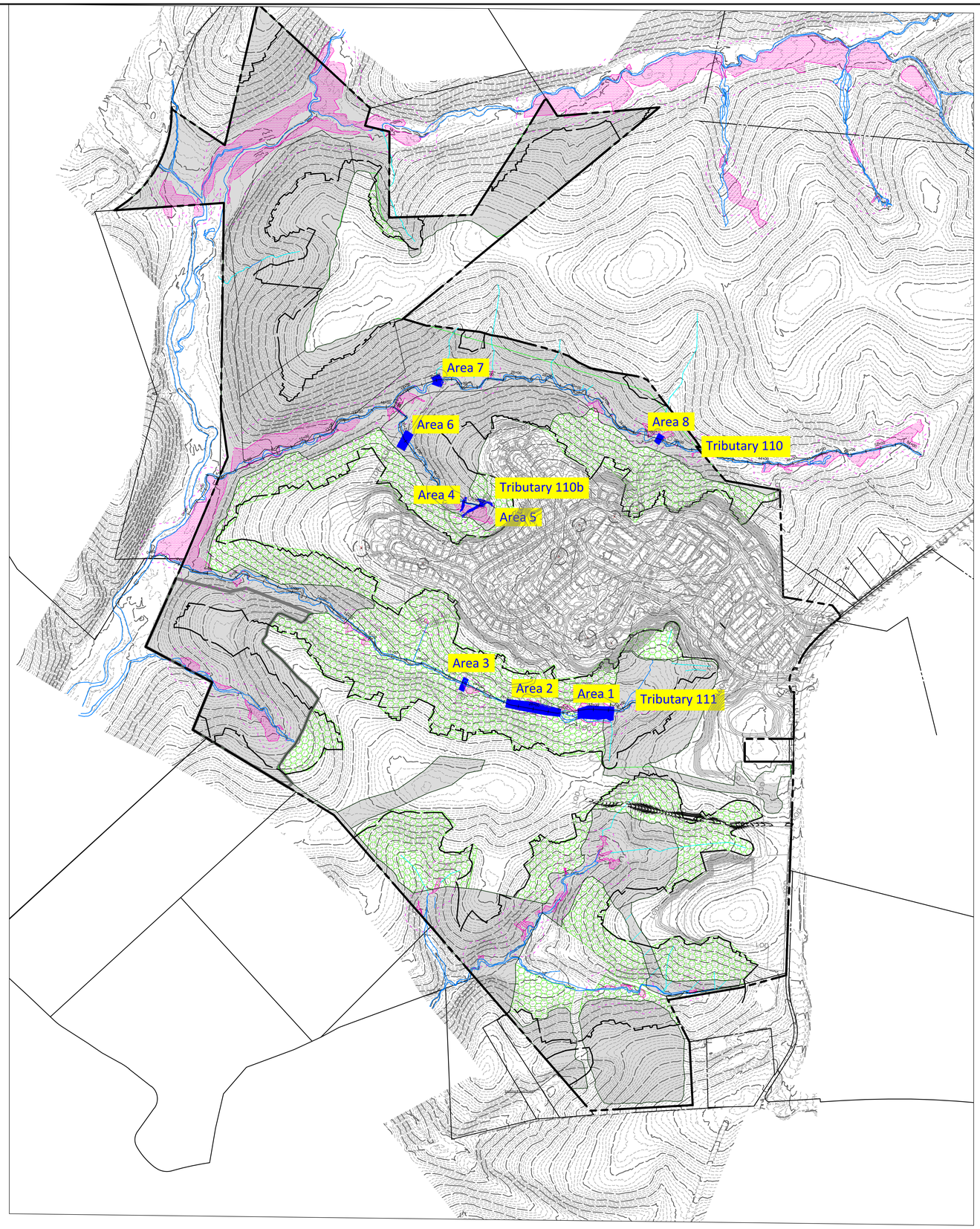
1. Areas 1 & 2 (740 LF)
   Station 33+35.47' - 26+17.21'
   a. Work between Area 1 and Area 2 to be connected to provide stable transition.
   b. Large head-cuts that have formed in the downstream of extent of Area 1 will dictate the elevations of any work within the channel.
2. Area 3 (40 LF)
   Station 23+27.36' - 22+93.21'
   a. Stabilize Cow Crossing.
   b. Remove trash/debris between Area 2 and Area 3.
   c. Failing springhouse to be removed and stable transition provided to its connection to the tributary. Existing conditions are hazardous.

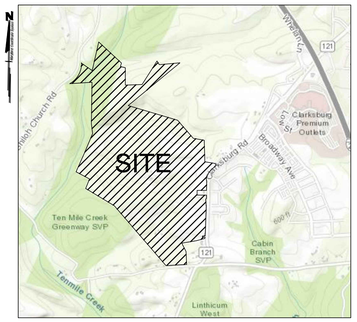
B. Tributary 110

1. Areas 4 & 5 (140 LF)
   Station 10+23.52' - 8+86.60'
   a. Remove trash and debris from within and around stream channel at Areas 4 & 5.
   b. Work between Areas 4 and 5 will need to connect in order to stabilize the channel in this area. Multiple head-cuts in area 5 will dictate the elevations of this channel work.
2. Area 6 (70 LF)
   Station 3+27.08' - 2+56.21'
   a. Stabilize/abandon ford crossings of tributary.
   b. Hand-remove old tires downstream of Area 6.
3. Area 7 (60 LF)
   Station 20+37.61' - Station 19+77.61'
   a. Stabilize/abandon ford crossing.
   b. Remove trash and debris, including a collapsed shelter/trailer home.
4. Area 8 (70 LF)
   Station 36+92.89' - 36+52.69'
   a. Stabilize historic ford crossing.

C. All tributaries

1. Remove all abandoned stream monitoring equipment and batteries.





Source:Maryland Environmental Resource Land Information Network (MERLIN)
(http://dnrweb.dnr.state.md.us/MERLIN/)

Vicinity Map
1"=2000'

LEGEND

- SITE LIMITS
- STREAM VALLEY BUFFER (SVB)
- PERENNIAL OR INTERMITTENT STREAM
- EPHEMERAL STREAM
- EXISTING CONTOURS (300, 298)
- PROPOSED CONTOURS (300, 298)
- STREAM RESTORATION AREA
- FOREST SAVE
- FOREST PLANTING
- NON-TIDAL WETLAND
- NON-TIDAL WETLAND BUFFER

Notes:

The intent of this Stream Restoration Exhibit is to meet the requirements of the Approved and Adopted Ten Mile Creek Area Limited Amendment, page 22, which requires the restoration of streams and wetlands adversely affected by existing uses.

GRAPHIC SCALE
300' 0 150' 300' 600' 1,200'
1 INCH = 300 FT

REVISION	DATE	REVISION	DATE	REVISION	DATE

Developer / Applicant:

Pulte Homes
10600 Arrowhead Drive, Suite 225
Fairfax, VA 22030
Attn: David DeMarco

PRELIMINARY
STREAM RESTORATION EXHIBIT
COVER SHEET

RODGERS CONSULTING
19847 Century Boulevard, Suite 200, Germantown, Maryland 20874
Ph: 301.948.4700 Fx: 301.948.6256 www.rodgers.com

	BY	DATE
BASE DATA		
DESIGNED		
DRAWN		
REVIEWED		

RODGERS CONTACT:
RELEASE FOR
BY_____ DATE ____

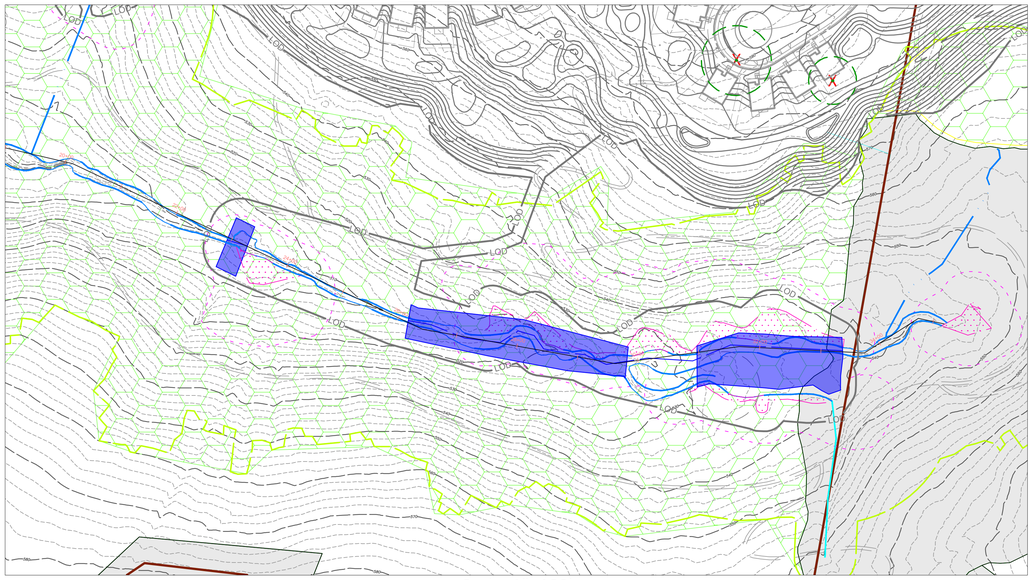
CREEKSIDE AT CABIN BRANCH

ELECTION DISTRICT NO. 2
MONTGOMERY COUNTY, MARYLAND

SCALE: 1"=300'
JOB No. 12894A1
DATE: May 2020
SHEET No. 1 OF 4

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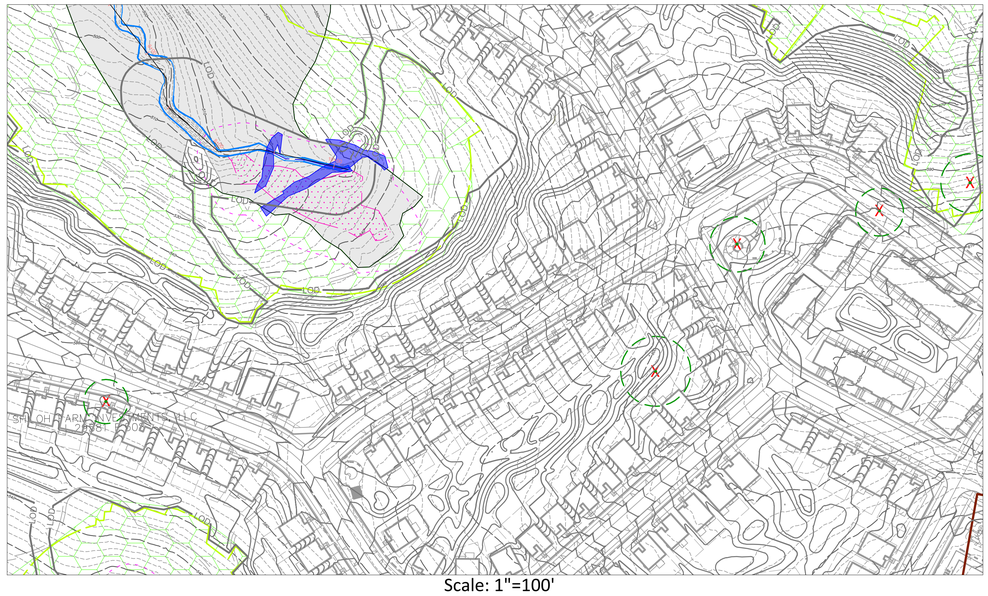
Areas 1, 2, and 3



Scale: 1"=100'

Work between Areas 1 and 2 will occur between stations 33+35.47' and 26+17.21', approximately 740 linear feet. The channel is currently flattened out at Area 1 and has transitioned into a wetland area . Channelization begins again at station 32+1.75'. Downstream, at Area 2, the stream banks are eroded and headcutting is occurring. The stream between Areas 1 and 2 will be reconnected to form a stable transition. A cow crossing at Area 3, located between stations 23+27.36 and 22+93.21, has resulted in bank erosion in need of stabilization. Based on velocities, the placement of rip-rap or Natural Fiber Rolls planted with native, wetland tolerant species, along the stream bank in these areas will help stabilize the channel and prevent further erosion. The unforested riparian buffer in this location will be afforested. As vegetative cover becomes established, the stability of the banks will become increasingly stabilized and protected. Trash and debris is to be removed at Station 24+75.72'. An existing springhouse and pumphouse at station 23+59.92' is hazardous and will be removed. Abandoned stream monitoring equipment that is present at Area 3 will be removed. See Sheet 3 - Existing Conditions Photos for photo documentation of the existing stream conditions described above for these areas. See Sheet 4 - Waterway Construction Details for potential stream restoration techniques to consider during final design and engineering.

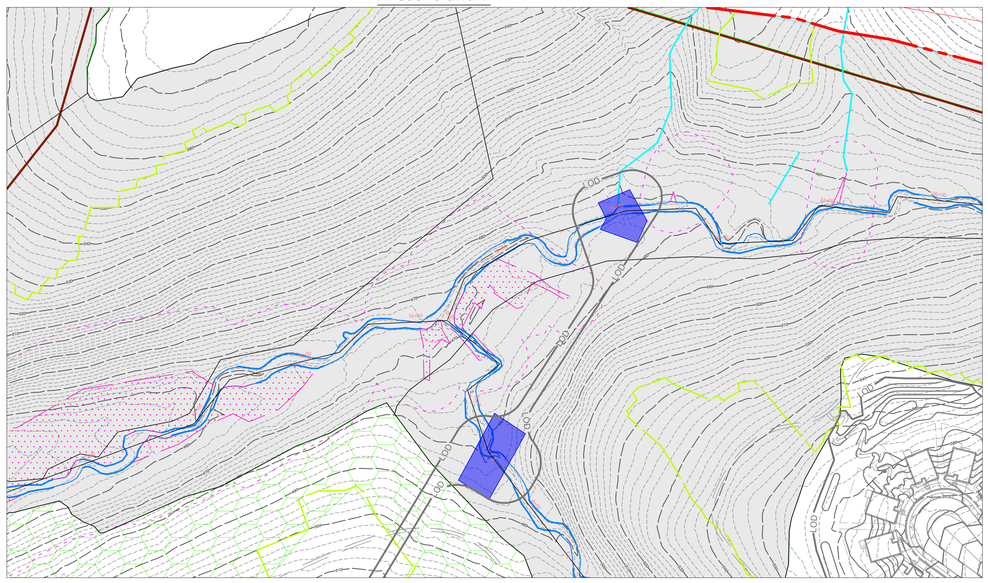
Areas 4 and 5



Scale: 1"=100'

Work in Areas 4 and 5 will occur between station 10+23.52' and 8+86.60', approximately 140 linear feet. The stream channel within these Areas is severely eroded and headcutting, with a significant drop-off occurring at station 9+83.28' that leads to another steep drop-off at station 8+30.02'. Work between Areas 4 and 5 will need to connect in order to stabilize the channel. Due to significant headcutting, step pools are proposed to raise the elevation to reconnect the stream bed. The construction of step pools will provide a gradual elevation change and will dissipate flow,reduce downstream velocity, and encourage sediment deposition to improve downstream conditions over time. Random boulder placement and/or cross vanes can also be used in areas of higher stream velocity (above 5 ft/s). Trash and debris will be removed within the headwater wetland and along the stream reach in these areas. See Sheet 3 - Existing Conditions Photos for photo documentation of the existing stream conditions described above for these areas. See Sheet 4 - Waterway Construction Details for potential stream restoration techniques to consider during final design and engineering.

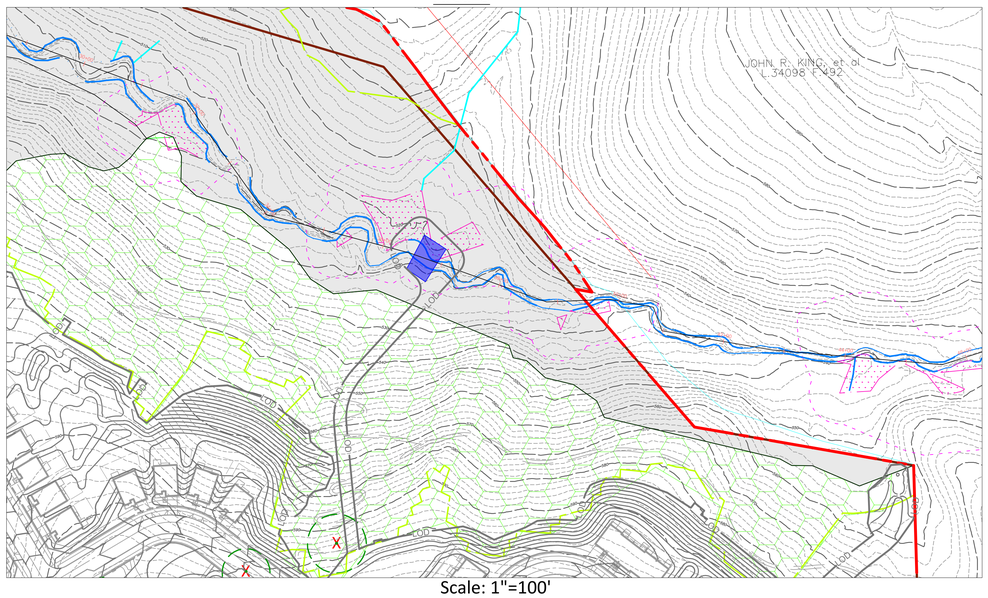
Areas 6 and 7



Scale: 1"=100'

Ford crossings at Areas 6 and 7 have resulted in the stream flow to dam up and destabilize and widen the channel. Proposed uplift will occur between stations 3+27.08'and 2+56.21' at Area 6, approximately 70 linear feet, and stations 20+37.61-19+77.61' at Area 7, approximately 60 linear feet, and will include removing the fords and re-establishing a stream channel. Random boulder placement and/or cross vanes in these areas can be used to reduce velocities prior to the tributaries connection to Ten Mile Creek mainstem. Downstream from Area 6 at station 0+56.73', the hand removal of tires dumped within and along the stream channel is also proposed. An abandoned structure/trailer at Area 7 is located at station 19+76.70' will be removed. See Sheet 3 - Existing Conditions Photos for photo documentation of the existing stream conditions described above for these areas. See Sheet 4 - Waterway Construction Details for potential stream restoration techniques to consider during final design and engineering.

Area 8



Scale: 1"=100'

Work at Area 8 will occur between stations 36+92.89' - 36+52.69' , approximately 70 linear feet, includes the removal and stabilization of a historic ford crossing. Random boulder placement and/or cross vanes can be utilized within the reestablished channel to help reduce water velocities. See Sheet 3 - Existing Conditions Photos for photo documentation of the existing stream conditions described above for these areas. See Sheet 4 - Waterway Construction Details for potential stream restoration techniques to consider during final design and engineering.

PRELIMINARY NOT FOR CONSTRUCTION

REVISION	DATE	REVISION	DATE	REVISION	DATE

Developer / Applicant:

Pulte Homes
10600 Arrowhead Drive, Suite 225
Fairfax, VA 22030
Attn: David DeMarco

PRELIMINARY STREAM RESTORATION EXHIBIT WORK AREAS

RODGERS CONSULTING
19847 Century Boulevard, Suite 200, Germantown, Maryland 20874
Ph: 301.948.4700 Fx: 301.948.6256 www.rodgers.com

	BY	DATE
BASE DATA		
DESIGNED		
DRAWN		
REVIEWED		

RODGERS CONTACT:
RELEASE FOR
BY_____ DATE ____

CREEKSIDE AT CABIN BRANCH

ELECTION DISTRICT NO. 2
MONTGOMERY COUNTY, MARYLAND

SCALE: 1"=100'
JOB No. 1289A1
DATE: May 2020
SHEET No. 2 OF 4

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Areas 1 and 2


Looking downstream at Area 1.


Looking upstream at Area 1 from where channel begins to spread out into a wetland area.


Area 1. Stream has flattened out into a wetland area. Numerous tire tracks observed through area.


Area 1 where flattened channel begins to become defined again.


Looking downstream at Area 2 where headcuts have formed.


Looking downstream at Area 2.


Debris at Area 2.

Area 3


Failing springhouse at Area 3.


Pump house at Area 3.


Cow crossing at Area 3.


Erosion occurring at cow crossing area at Area 3.


Abandoned monitoring equipment and batteries throughout site.

Areas 4 and 5


Facing upstream at Area 5.


Severe erosion and headcutting formed a steep drop-off at Area 4.


Erosion and headcutting at Area 4 downstream of steep drop-off.


Trash and debris around and within stream channel at Areas 4 and 5.

Area 6


Historic ford crossing of stream is currently unstable and damming water flow.


Erosion and headcutting occurring at Area 6, with debris within the stream channel.


Tires in and around stream channel downstream from Area 6.

Area 7


Collapsed structure and other trash/debris at Area 7.


Historic ford crossing at Area 7.


Historic ford crossing at Area 7.

Area 8


Historic ford crossing of stream with erosion and undercutting of the bank at Area 8.


Undercutting of the bank at Area 8.

REVISION	DATE	REVISION	DATE	REVISION	DATE

Developer / Applicant:

Pulte Homes
10600 Arrowhead Drive, Suite 225
Fairfax, VA 22030
Attn: David DeMarco

PRELIMINARY
STREAM RESTORATION EXHIBIT
EXISTING CONDITIONS PHOTOS

RODGERS CONSULTING
19847 Century Boulevard, Suite 200, Germantown, Maryland 20874
Ph: 301.948.4700 Fx: 301.948.6256 www.rodgers.com

	BY	DATE
BASE DATA		
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REVIEWED		

RODGERS CONTACT:
RELEASE FOR
BY_____ DATE ____

CREEKSIDE AT CABIN BRANCH

ELECTION DISTRICT NO. 2
MONTGOMERY COUNTY, MARYLAND

SCALE: N/A
JOB No. 12894A1
DATE: May 2020
SHEET No. 3 OF 4

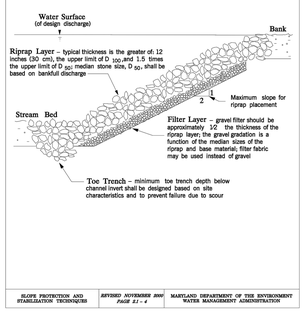
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PRELIMINARY NOT FOR CONSTRUCTION

PRELIMINARY NOT FOR CONSTRUCTION

Maryland's Guidelines To Waterway Construction
DETAIL 2.1: RIPRAP

SECTION VIEW



MGWC 2.1: RIPRAP

Rigid engineering technique for bank stabilization

DESCRIPTION

Riprap is used to protect and stabilize embankment soils from the erosive forces of flowing water and piping forces resulting from groundwater seepage. A well-engineered riprap system should consist of the following:

- a filter layer of gravel or cloth designed to prevent soil movement into or through the riprap layer while allowing water to drain from the embankment, and
- a stone layer of appropriate gradation and thickness to resist the shearing forces of channelized water.

EFFECTIVE USES & LIMITATIONS

When properly designed and installed, riprap is an effective method where soil conditions, water turbulence and velocity, expected vegetative cover, and groundwater conditions are such that the soil may erode under the design flow conditions. Some common areas of riprap applicability are:

- diversion channel banks and/or bottoms,
- roadside ditches,
- drop structure outlets, and
- laterally expanding banks threatening infrastructure or personal property.

Additionally, properly graded riprap forms a flexible, self-healing cover which can be easily repaired in localized areas by the timely replacement of stone. Uniform-grade riprap can also be used with a geotextile filter cloth.

Filter cloth should only be utilized when the bank material is noncohesive such as sand or gravel.

MATERIAL SPECIFICATIONS

- *Filters:* Material and design specifications for granular filters are found in Table 3.1a.

Table 3.1a: Granular Filter Material Grading Specifications

% less than	U.S. Standard sieve size
100	2 ½ in (64 mm)
85-100	1 in (25 mm)
60-100	½ in (13 mm)
35-70	No. 10
20-50	No. 40
3-20	No. 200

The thickness of the filter should not be less than 6 inches (15 cm). Generally, filters that are one-half the thickness of the riprap layer are satisfactory.

Synthetic filter cloth may be used cautiously based on the *1994 MD Standards and Specifications for Soil Erosion and Sediment Control*.

- *Riprap:* The maximum diameter or weight of stone for riprap should be based upon the design flow velocity using Figure 3.1. This chart is based on a maximum slope of 2H:1V. The stone gradations for Classes I - III are found in Table 3.1b.

MGWC 2.1: RIPRAP

Table 3.1b: Stone Gradations for Riprap Stone Classes

Class	Size	% Total Weight < Given Size
I	150 lb (70 kg)	100
	2 lb (1 kg)	10 max
II	700 lb (320 kg)	100
	20 lb (10 kg)	10 max
III	2000 lb (910 kg)	100
	40 lb (20 kg)	10 max

Uniform-grade riprap should incorporate angular rock to promote interlocking.

Approximate Cost ($1999)
$78 per linear ft

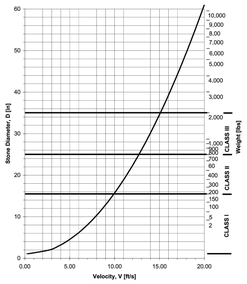
INSTALLATION GUIDELINES

All erosion and sediment control devices, including dewatering basins, should be implemented as the first order of business according to a plan approved by the WMA or local authority. Once a slope stabilization project is initiated, preparation and placement of the riprap should immediately follow the initial disturbance to minimize the chances for further slope degradation. The recommended construction procedure for riprap is as follows beginning with initial slope preparations (refer to Detail 2.1):

1. The contractor should install all sediment and erosion control devices as the first order of business.
2. Excavation should be made in reasonably close conformity with the existing stream slope and bed.
3. All fill in the subgrade should be compacted to a density approximating that of the surrounding undisturbed material.
4. Provisions must be made to anchor the riprap at the stream bed so as to provide protection against undermining. If this cannot be accomplished by creating a toe trench, an alternative method of protection must receive prior written approval from the WMA or local authority.
5. The filter layer or blanket should be placed immediately after slope preparation.
   - The stone for granular filters should be spread in a uniform layer to the specified depth. Where more than one layer is employed, they should be spread such that there is minimal mixing.
   - When cloth filters are used, special care should be taken not to damage the fabric during riprap placement.
6. Riprap placement should begin with the toe. The larger stones, as specified by the design gradation, should be placed in the toe and along the perimeter of the slope and channel protection. The riprap should be placed with suitable equipment in such a manner as to produce a reasonably graded mass of stones with zero drop height. The placing of stones that cause extensive segregation is not allowed. Where appropriate, a low flow channel shall be constructed through the riprap.
7. Any excavation voids existing along the edges of the completed slope and channel protection should be backfilled and compacted.
8. All disturbed areas should be permanently stabilized in accordance with an approved sediment and erosion control plan.

Note: *The use of rock vanes (MGWC 3.3: Rock Vanes) should be considered to redirect high-velocity flows at the toe.*

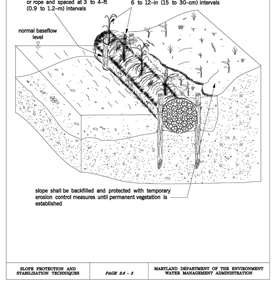
FIGURE 2.1: RIPRAP DIAMETER AS A FUNCTION OF STREAM VELOCITY (BASED ON ISHBASH EQUATION)



Maryland's Guidelines To Waterway Construction
DETAIL 2.6: NATURAL FIBER ROLLS

DETAIL

Adapted From Goldsmith and Bestmann (1992)



MGWC 2.6: NATURAL FIBER ROLLS

Natural fiber and vegetative system for bank stabilization

DESCRIPTION

Natural fiber rolls are commonly made from coir fiber and netting. They are used to provide channel and shoreline stabilization in areas of low shear stress by acting as a medium for plant propagation.

EFFECTIVE USES & LIMITATIONS

Natural fiber rolls are used to stabilize slopes and improve aesthetics in areas of low shear stress by encouraging the growth of vegetation. Coir fiber used in these rolls has a high tensile strength, is biodegradable, and has excellent moisture retention and sediment trapping properties to encourage plant growth. Natural fiber rolls are easily installed with wooden stakes, can be readily molded to fit the bank line, and over time blend naturally into the aquatic environment. Once vegetation becomes established in these rolls, slope stability is increased by fibrous root systems which consolidate the surrounding soil, and leaves and stalks of herbaceous plant species which lessen energy of moving water and elastically deform in flood flows, thereby covering the bank and protecting it from erosion without blocking the channel.

Natural fiber rolls can also be used as toe protection in ponds and lakes where flow velocities are low and moderate toe stabilization is required.

Natural fiber rolls should be avoided in channels which are actively incising and in reaches with large debris loads and/or potential for significant toe build up. Additionally, the following Rosgen stream types should be avoided when considering the use of fiber rolls: A1, A2, B1, C1, D3-D6, DA, F1, G1, G6, and G5.

MATERIAL SPECIFICATIONS

- *Fiber logs:* Natural fiber logs composed of biodegradable materials such as coir fiber are commercially available in 16 or 18-inch (0.40 or 0.45-meter) diameters rolls.
- *Plantings:* Vegetative plantings should be chosen according to their adaptability to site-specific conditions and objectives by a plant specialist.
- *Live stakes:* Live stakes should be cut from fresh, green, healthy dormant parent plants which are adapted to the site conditions whenever possible.

Approximate Cost ($1999)
$61 per running foot (installed)

INSTALLATION GUIDELINES

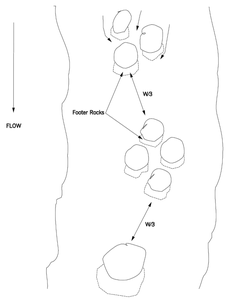
All erosion and sediment control devices, including dewatering basins, should be implemented as the first order of business according to a plan approved by the WMA or local authority. Refer to the *1994 Maryland Standards and Specifications for Soil Erosion and Sediment Control*. The recommended construction procedure for natural fiber logs should proceed as follows (refer to Detail 2.6):

1. Natural fiber rolls should be installed so that they rest against the bottom of the waterway in ponds or lakes. In streams and rivers, the first row of fiber logs should be placed above any necessary toe stabilization measures. Natural fiber logs should not be used as the primary toe stabilization measure in streams or rivers.

MGWC 2.6: NATURAL FIBER ROLLS

2. Plants should be plugged in an alternating pattern along the top of the fiber log in gaps between the coir fiber netting. Appropriate species and a spacing ranging from 6 to 12 inches (0.15 to 0.3 meters) should be selected by a plant specialist according to site characteristics such as soil properties, anticipated post-construction bank slope, water chemistry, amount of available sunlight, and expected duration of inundation during high stream flows. If live stakes are used to secure the fiber logs, they should be placed on the front of their diameter, plants should be plugged inside the soil/log interface where they will receive adequate moisture.
3. Dead or live stakes should be used to anchor the fiber logs in place. Stakes should be notched approximately 5 inches (13 centimeters) from their tops and pounded partially into the ground on either side of the bundle at a spacing of 3 to 4 feet (0.9 to 1.2 meters). Twine should be tied from the notch in one stake to the notch in the stake directly opposite. The stakes should then be driven so that the twine is secured against the top of the roll. Ideally, the top of the stake should be flush with the top of the roll.
4. The ends of adjacent logs should be lapped together with twine by making a number of passes in the end netting between the logs and pulling the twine taut. Where a fiber roll does not abut another fiber roll, the end should be bent inward and buried in the bank to prevent water from intruding behind the roll and dislodging it.
5. Successive rows of fiber rolls should be offset 3 to 8 inches (8 to 20 centimeters). Additionally, to ensure that roots extend into the soil, plants should be plugged into the sides of the fiber log near the soil. The need to backfill/contour the soil behind the fiber logs and between successive lifts will depend on the specific aesthetic and physical requirements of the project. The re-contoured soil should be seeded and/or plugged with appropriate vegetative species and covered with an erosion control blanket to prevent slope erosion.

Maryland's Guidelines To Waterway Construction
DETAIL 3.1: BOULDER PLACEMENT



MGWC 3.1: BOULDER PLACEMENT

Improvement/creation of aquatic habitat

DESCRIPTION

The work should consist of placing boulders in stream channels to encourage riffles and pools and to provide habitat and spawning areas for aquatic life.

EFFECTIVE USES & LIMITATIONS

When properly utilized, boulder placements create small scour pools and eddies which can be used as rearing areas for salmonids and other fish. Additionally, they are sometimes used to restore meanders and pools in channelized reaches and to protect eroding streambanks by deflecting flow. Boulder placements are most effective when used in the following conditions:

- moderately wide, shallow, high velocity streams with gravel or cobble beds;
- stream reaches with pool densities less than 20 percent; and
- Rosgen stream types B3 and B4.

Boulder placements should be avoided in the following areas:

- channels which do not have sufficient particle size ranges to develop armor layers such as streams with fine, noncohesive bed material such as sand or small gravel that will scour deeply and rapidly, thereby undermining and burying boulder groups;
- channels with highly erodible embankment soils or soils with an extreme excess of one texture or size range unless measures are taken to adequately reinforce the banks;
- low-velocity streams with a mean velocity of less than about 2 feet (0.6 meters) per second, since sufficient scour pools cannot be developed;
- newly formed stream curvatures since boulder clusters can alter natural patterns of stream meander resulting in erosion and scour problems; and
- and overwide streams or streams with large bedload.

MATERIAL SPECIFICATIONS

Boulders should be chosen based upon stream size, flow characteristics, bed stability, desired habitat effects such size and position of resultant scour pools and eddies, and the capacity of available heavy equipment. Boulder diameters of 2 to 3 feet (0.6 to 1.5 meters) and volumes of 35 to 70 cubic feet (1 to 2 cubic meters) have been successfully used in many applications. The following equation may be used to size boulders from guidelines developed for riprap placement found in MGWC 2.1: Riprap and that footers be provided. However, boulders should not be more than 25 to 30% of bankfull depth after partial embedment. Blocky, angular rock should be used in place of round rock when feasible.

Boulder diameters should be no more than 1/8 the width of the stream. If a larger size is to be used, bank stabilization measures should be considered.

Approximate Cost ($1999)
$703 per ten boulders

MGWC 3.1: BOULDER PLACEMENT

INSTALLATION GUIDELINES

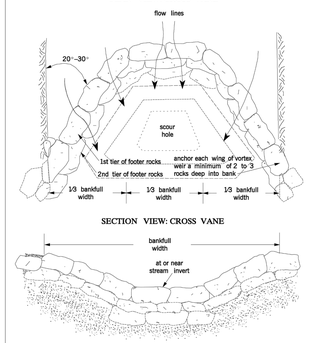
All erosion and sediment control devices, including dewatering basins, should be implemented as the first order of business according to a plan approved by the WMA or local authority. Boulder placement should proceed as follows (refer to Detail 3.1):

1) Complete the work during periods of low flow to ensure proper location within the stream channel and to facilitate the movement of heavy equipment.
2) Boulders shall be placed on top of footer rock(s) so that the boulder is offset in the upstream direction.
3) Place clusters comprised of 3 to 5 boulders arranged in a triangular configuration in the downstream half of long riffles, sufficiently far from the associated pool, and embed them in the stream bed to increase the cluster's stability. The substrate in which boulders are placed should be competent enough to resist undermining.
4) Space multiple boulder clusters constructed in the same stream section a minimum of 1/3 of a stream width apart. Avoid an overabundance of newly placed boulders since this can inhibit the natural process of sediment flushing.

Maryland's Guidelines To Waterway Construction
DETAIL 3.8(a): CROSS VANES

Source: Rosgen, 1999

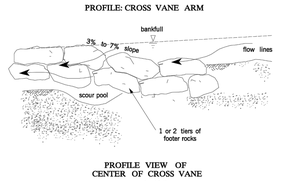
PLAN VIEW: CROSS VANE



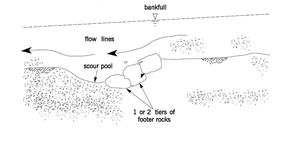
Maryland's Guidelines To Waterway Construction
DETAIL 3.8(b): CROSS VANE

Source: Rosgen, 1999

PROFILE: CROSS VANE ARM



PROFILE VIEW OF CENTER OF CROSS VANE



MGWC 3.8: CROSS VANES

Rigid engineering techniques for creation of aquatic habitat and channel grade control

DESCRIPTION

Low profile in-stream structures such as cross vanes are primarily used to create aquatic habitat in the form of scour pools and for grade control on incising streams and rivers. Additionally, they are well-suited for channeling flow away from unstable banks.

EFFECTIVE USES & LIMITATIONS

Cross vanes are typically suited for use in moderate to high gradient streams. Cross vanes are best suited to Rosgen stream types A3-A4, B3-B4, C3-C4, F3-F4, and G3-G4. When constructed and spaced properly, cross vanes can simulate the natural pattern of pools and riffles occurring in undisturbed streams while forming gravel deposits which fish use as spawning grounds. Cross vanes can also be used to stabilize banks when designed properly.

Cross vanes should be avoided in channels with bedrock beds or unstable bed substrates, and streams with naturally well developed pool-riffle sequences.

MATERIAL SPECIFICATIONS

Rock and boulder material for the construction of cross vanes should meet the following requirements:

Footer Rocks: Vortex rocks should be large enough to achieve the desired height when partially buried in the stream bed and should be sized to resist movement from shear stresses expected for the design flow. Footer rocks should be long and flat.

Riprap: Riprap for added stability, bank armoring, and toe protection should be capable of withstanding bankfull flow velocities according to MGWC 2.1: Riprap.

Approximate Cost ($1999)
$1,212 per structure

INSTALLATION GUIDELINES

All erosion and sediment control devices, including dewatering basins, should be implemented as the first order of business according to a plan approved by the WMA. The recommended construction procedure for both cross vanes and weirs should proceed as follows (refer to Detail 3.8):

1. The stream should be diverted according to a WMA recommended measure, and the construction area should be dewatered.
2. Cross vanes are typically designed with a "U" shape such that the apex of the structure points upstream. The angle the arms make with the upstream bank should be approximately 20 to 30 degrees so that flows are directed away from the banks and deeper pool areas are created directly downstream of the vane or weir. All rocks should touch adjacent rocks to form a tight fit. Vane rocks shall be placed on top of footer rocks so that each vane rock rests upon two halves of each footer rock below, and so that the vane rock is offset in the upstream direction. Vane rocks shall be shingled upstream. On unstable bed substrates, two tiers of footer rocks may be required to

MGWC 3.8: CROSS VANES

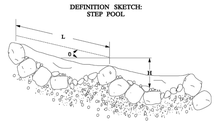
prevent the downstream face of the vortex weir or cross vane from being undermined. The top elevation of the center rock(s), at the apex of the weir or vane, should be at or near bed level to permit fish passage at low flows, and the end rocks on either bank should be at bankfull level. Once the excavated portion of the bank has been backfilled, it should be armored with appropriately sized riprap, sod mats, or willow transplants.

3. Adjacent cross vanes should be spaced sufficiently far apart to allow for proper riffle or pool development according to step-pool and pool-riffle configurations as provided in MGWC 3.9: Step Pools. Additionally, it has been recommended that the overall maximum drop controlled by a set of weirs should be less than 2 feet (0.6 meters) for stability reasons.
4. All disturbed sections of the channel, including the banks and streambed, should be stabilized with methods approved by the WMA.
5. All cross vanes should be monitored to determine if:
   - their orientation and geometry (e.g., the height of the drop) hinder fish migration,
   - their performance is adversely affected by deposited sediment, and
   - their placement causes bank instabilities and undesirable lateral stream movement especially in the vicinity of the plunge pools.

Maryland's Guidelines To Waterway Construction
DETAIL 3.9(a): STEP POOLS

Adapted From Abrahams et al. (1995)

DEFINITION SKETCH: STEP POOL



Note: L is measured parallel to the bed slope (tan θ)
H is measured perpendicular to the horizontal

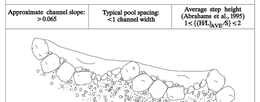
Maryland's Guidelines To Waterway Construction
DETAIL 3.9(b): STEP POOLS

Adapted From Montgomery and Buffington (1997)

PROFILE VIEW: CASCADE & STEP POOL MORPHOLOGIES



Approximate channel slope:	Typical pool spacing:	Average step height (Abrahams et al., 1995)
> 0.065	<1 channel width	1<{(H/L)/sin θ} ≤ 2

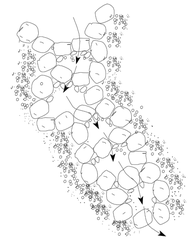


Approximate channel slope:	Typical pool spacing:	Average step height (Abrahams et al., 1995)
0.030-0.065	1-4 channel widths	1< {(H/L)/sin θ} ≤ 2

Maryland's Guidelines To Waterway Construction
DETAIL 3.9(c): STEP POOLS

Section & Plan Views Adapted From Rosgen (1996)

PLAN VIEW: STEP POOL



MGWC 3.9: STEP POOLS

Technique for grade control and improvement of aquatic habitat

DESCRIPTION

The work should consist of constructing step-pool sequences to stop headwater stream channels for grade control and to create diversified aquatic habitat through flow diversification. Step pool channels are characterized by a series of channel-spanning steps formed by large grouped boulders-cobled clasts that separate pools containing fine bed sediments. As supercritical flow tumbles over the step, energy is dissipated in roller eddies and becomes subcritical in the associated downstream plunge pool.

EFFECTIVE USES & LIMITATIONS

Step-pool morphologies are typically associated with well confined, high-gradient channels with slopes greater than 3%, having small width-depth ratios and bed material dominated by cobbles and boulders. Step pools generally function as grade control structures and aquatic habitat features by reducing channel gradients and promoting flow diversity. At slopes greater than roughly 6.5%, similar morphologic units termed cascades spanning only a portion of the channel width are found in these conditions. Step pools and cascades are generally found in the following Rosgen stream types: A1-A3 and B1-B3.

MATERIAL SPECIFICATIONS

Natural steps in step-pool morphologies can be formed by large clasts, bedrock outcrops, and large woody debris aligned across the channel. Engineered steps can be made from boulders, logs, and large woody debris chosen according to the desired height of the step. Additionally, boulders should be sized to resist the design storm event using MGWC 2.1: Riprap as a guide.

INSTALLATION GUIDELINES

All erosion and sediment control devices, including dewatering basins, should be implemented as the first order of business according to a plan approved by the WMA or local authority. The proposed construction sequence for step pools is as follows (refer to Detail 3.9):

1. The stream should be redirected by an approved temporary stream diversion (See *Section 1: Temporary Instream Construction Measures, Maryland's Guidelines to Waterway Construction*), the construction area should be dewatered, and any disturbed banks should be stabilized.
2. Step-pool units should be designed and constructed to have a characteristic step height, H, and step length, L, as shown in Detail 3.9, and all steps should be firmly anchored into the stream bank.
3. Step rocks shall be placed on footer rocks so that they rest on two halves of each footer rock below, and so that the step rock is offset in the upstream direction. Footer rocks should extend below the scour hole elevation.
4. As a general guideline, the ratio of the mean steepness, defined as the averaged value of step height over step length, to the channel slope, S, should lie in the range of 1 to 2 {H /(H/L)sin θ/ S 2}. Typical spacings for step pools and cascades are provided in Detail 3.9(b) relating to alluvial channel morphologies.
5. Whenever practical, a reference reach with similar flow rates, bed and bank material characteristics, type and density of riparian vegetation, and channel gradient should be surveyed at low flows to determine appropriate values of H and L. At high discharges, step-pool characteristics may be obscured.

MGWC 3.9: STEP POOLS

6. Once construction is completed, the diversion should be removed from upstream to downstream. Sediment control devices, including perimeter erosion controls, are to remain in place until all disturbed areas are stabilized in accordance with an approved sediment and erosion control plan and the inspection authority approves their removal.

Note: Details provided for reference. Methods selected may change at final design/engineering.

REVISION	DATE	REVISION	DATE	REVISION	DATE

Developer / Applicant:

Pulte Homes
10600 Arrowhead Drive, Suite 225
Fairfax, VA 22030
Attn: David DeMarco

PRELIMINARY
STREAM RESTORATION EXHIBIT
WATERWAY CONSTRUCTION DETAILS

RODGERS CONSULTING
19847 Century Boulevard, Suite 200, Germantown, Maryland 20874
Ph: 301.948.4700 Fx: 301.948.6256 www.rodgers.com

	BY	DATE
BASE DATA		
DESIGNED		
DRAWN		
REVIEWED		

RODGERS CONTACT:

RELEASE FOR ☐
BY_____ DATE ____

CREEKSIDE AT CABIN BRANCH

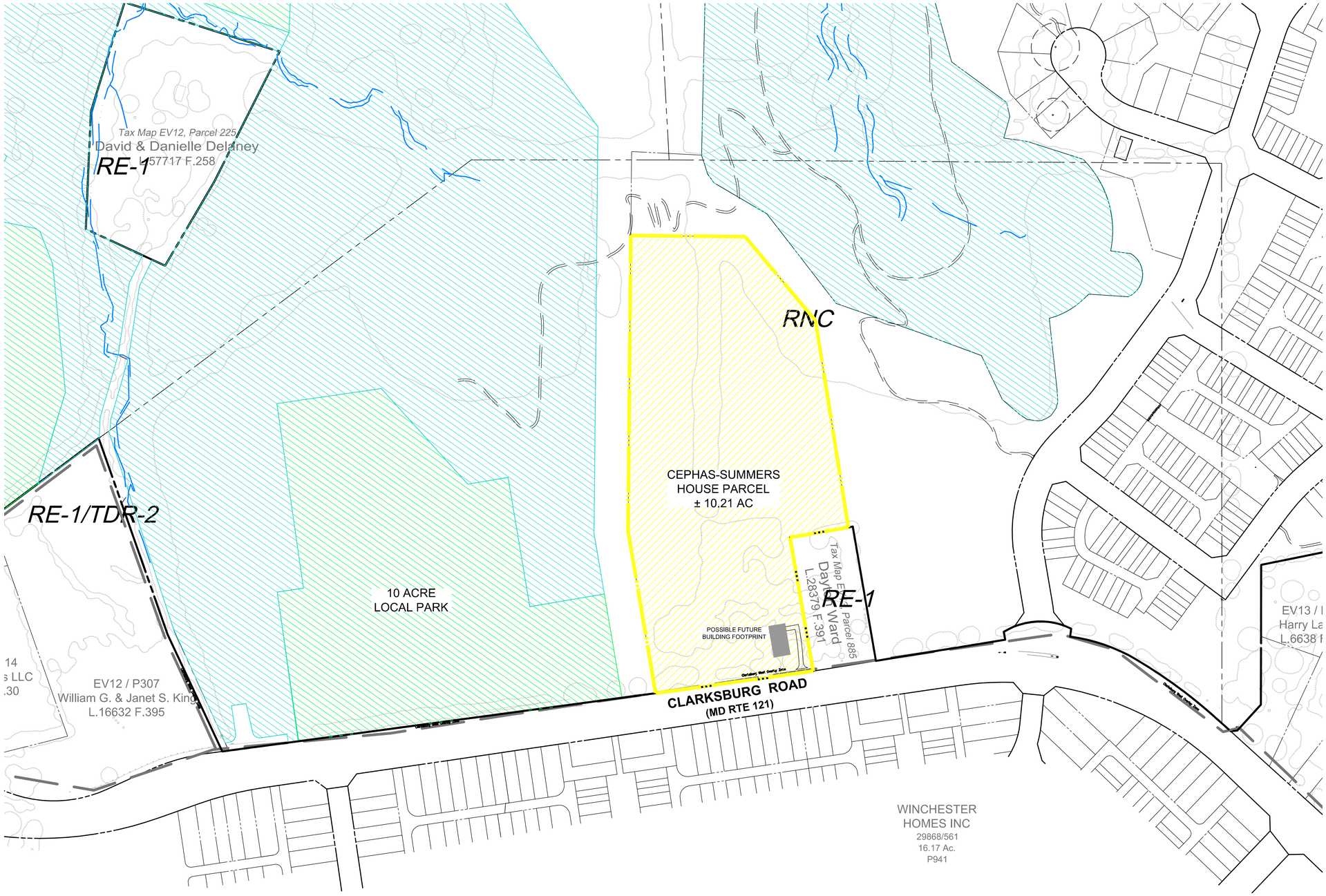
ELECTION DISTRICT NO. 2
MONTGOMERY COUNTY, MARYLAND

SCALE: N/A
JOB No. 1289A1
DATE: May 2020
SHEET No. 4 OF 4

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ATTACHMENT 8

PRELIMINARY NOT FOR CONSTRUCTION



GRAPHIC SCALE

100' 0 50' 100' 200' 400'

1 INCH = 100 FT

SCALE: 1" = 100'

NOTE: UNLESS SPECIFICALLY NOTED ON THIS PLAN DRAWING OR IN THE PLANNING BOARD CONDITIONS OF APPROVAL, THE BUILDING FOOTPRINTS, BUILDING HEIGHTS, ON-SITE PARKING, SITE CIRCULATION, AND SIDEWALKS SHOWN ON THE PRELIMINARY PLAN ARE ILLUSTRATIVE. THE FINAL LOCATIONS OF BUILDINGS, STRUCTURES AND HARDSCAPE WILL BE DETERMINED AT THE TIME OF SITE PLAN APPROVAL. PLEASE REFER TO THE ZONING DATA TABLE FOR DEVELOPMENT STANDARDS SUCH AS SETBACKS, BUILDING RESTRICTION LINES, BUILDING HEIGHT, AND LOT COVERAGE FOR EACH LOT. OTHER LIMITATIONS FOR SITE DEVELOPMENT MAY ALSO BE INCLUDED IN THE CONDITIONS OF THE PLANNING BOARD'S APPROVAL.

07-PREL-120200050-018D

PRELIMINARY PLAN #120200050
WSSC MAPS 230NW14, 230NW15, 231NW14, 231NW15, 232NW14 AND 232NW15
TAX MAPS DW, GRID DW61, EW, GRID EW11, DV, GRIDS DV63 & DV62, EV123, GRID EV13, & EV122, GRID EV12

PROFESSIONAL CERTIFICATION

"I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland, License No. 32599, Expiration Date: 1/22/22."

REVISION	DATE	REVISION	DATE	REVISION	DATE

DEVELOPER/APPLICANT:

PULTE HOMES
10600 ARROWHEAD DRIVE, SUITE 225
FAIRFAX, VA 22030
ATTN: DAVID DEMARCO

CREEKSIDE AT CABIN BRANCH

PARCEL 222, L.29581 F.499, PARCEL 900, L.29581 F.499
PARCEL 600, L.29581 F.508, & PARCEL 900, L. 29868 F.544
ELECTION DISTRICT No. 2
MONTGOMERY COUNTY, MARYLAND

RODGERS CONSULTING
19847 Century Boulevard, Suite 200, Germantown, Maryland 20874
Ph: 301.948.4700 Fx: 301.948.6256 www.rodgers.com

	BY	DATE
BASE DATA		
DESIGNED		
DRAWN		
REVIEWED		

RODGERS CONTACT:

RELEASE FOR

BY_____ DATE____

10 ACRE CEPHAS-SUMMERS HOUSE EXHIBIT

SCALE: 1" = 100'
JOB No. 0377AB8
DATE: OCT., 2020
SHEET No. 18D OF 27

N:\MD-Montgomery\Ten Mile Creek\autocad\Pre Plan\Exhibit\Cephas House Exhibit\10 ACRE LOT EXHIBIT.dwg 10 ACRE EXHIBIT Oct 06, 2020, 3:54pm

RODGERS CONSULTING | Knowledge Creativity Enduring Values

TO: Maryland National-Capital Park and Planning Commission, Planning Staff

FROM: Rodgers Consulting, Inc.

SUBJECT: Creekside at Cabin Branch – Noise Analysis

DATE: October 6, 2020

As noted in the 1983 Staff Noise Guidelines specific criteria is provided on pages 6-8, the residential noise level of 60 to 65 dBA is the outside residential noise guideline. Generally applied to rear outside spaces for residential homes. Creekside is zoned residential with residential development proposed. On page 8 there is reference to Map 2-1, with language that subsequent Master Plans may update the 1983 information.

> *The areas where these exterior guideline values would apply are shown on Map 2-1. This map should be used for general reference purposes only. Recommended exterior noise levels shown for specific areas in subsequent sector and master plans may differ from Map 2-1 due to updated, more detailed traffic information for existing and future.*

The 1994 Clarksburg Master Plan, Roadway Noise Impact Areas (Figure 47, attached) established the 60 dBA and 65 dBA impact areas.

The Creekside residential development is west of Clarksburg Road (A-27), therefore outside the noise impact area established by the 1994 Master Plan and is below the basic residential noise dBA level. With no further noise study required.

In addition to the Master Plan the land plan mitigates noise for rear yards similar to the approvals for Cabin Branch east of MD Rte. 121. No specific noise studies were required for Cabin Branch based on the Master Plan finding. Cabin was approved with units facing the road. The residential unit, or building is the noise mitigation so that the rear yard is below the 65 dBA outside criteria. The interior noise level of 45 dBA is mitigated by building materials to meet the standard at building permit. As the Cabin Branch homes are close to MD Rte. 121, the Creekside homes are a minimum of 140’ or farther from the road, with grade changes and landscaping. The homes face MD Rte. 121, with the rear outdoor spaces behind the buildings.

Respectfully,

Gary F. Unterberg, RLA, LEED AP BD+C
Senior Vice President

Roadway Noise Impact Areas

Figure 47

