This instrument prepared by:
Tennessee Department of Environment and Conservation
Division of Water Resources
312 Rosa L. Parks Ave., 10th Floor
Nashville, Tennessee 37243

STATE OF TENNESSEE
COUNTY OF DAVIDSON

NOTICE OF LAND USE RESTRICTIONS
("*[Add Property Name]*")

Notice is hereby given that, pursuant to their respective authorities found at Tennessee Code Annotated ("T.C.A.") § 68-212-225 and 33 Code of Federal Regulations ("C.F.R.") § 332.7(a), the Commissioner of the Tennessee Department of Environment and Conservation ("TDEC") and the District Engineer of the United States Corps of Engineers ("USACE") determined that land use restrictions are appropriate for the protection of streams and wetlands, or for other environmental conservation purposes, at the below-described property. Pursuant to T.C.A. § 68-212- 225(d) the register of deeds shall record this Notice of Land Use Restrictions ("Notice") and index it in the grantor index under the name of the owner of the property.

WITNESSETH:

WHEREAS, to its actual knowledge, the Metropolitan Government of Nashville and Davidson County ("Owner") is the sole owner in fee simple of approximately 336 acres of real property (Metro Parcel ID No. 09402022900; the "Property);

WHEREAS, the Property possesses natural resources with significant aquatic, ecological and habitat values ("Conservation Values"). These natural resources are of aesthetic, ecological, educational, historical, recreational, and scientific value to the Nation and its people. These values include Waters of the United States, as defined in 40 C.F.R § 122.2 and 33 C.F.R. Part 328, and Waters of the State, as defined in T.C.A. § 69-3-101, *et seq*., including streams, wetlands and the adjacent uplands, and other native vegetation and wildlife. These natural resources are of great importance to USACE, TDEC and Owner;

WHEREAS, a portion (the "Protected Mitigation Area") of the Property, as depicted on **Exhibit A**, has been approved by USACE for use as compensatory mitigation pursuant to and as defined in 33 C.F.R. Part 332;

WHEREAS, the Protected Mitigation Area is managed by Owner; however the Metropolitan Department of Water and Sewerage Services ("MWS") is constructing and managing the approved mitigation project on behalf of the Owner;

WHEREAS, the Protected Mitigation Area is identified as being occupied by, or as being potential habitat for species of native plants and wildlife, which Owner desires to establish, preserve, protect, restore, and enhance;

WHEREAS, on or about _____, the Commissioner of TDEC issued Aquatic Resource Alteration Permit Number _____ ("ARAP") to _____, incorporated herein by reference;

WHEREAS, on or about _____, the _____ District Engineer of the USACE issued Department of the Army Permit Number _____ ("DA Permit") pursuant to Section 404 of the Clean Water Act to _____, incorporated herein by reference;

WHEREAS, the ARAP and DA Permit, and any modifications thereto, authorize certain activities which could affect wetlands or other surface waters in or of the State of Tennessee;

WHEREAS, the ARAP and DA Permit and approval of the Protected Mitigation Area for use as mitigation require that certain uses on the Protected Mitigation Area be restricted; and

WHEREAS, the ARAP and DA Permit contemplate the performance of certain streambank restoration work within the Protected Mitigation Area as provided in the Compensatory Mitigation Plan ("CMP") attached as **Exhibit B**;

WHEREAS, the purpose of this Notice is to ensure that the Protected Mitigation Area will be retained forever in an open space condition and to prevent any use of the Protected Mitigation Area that will impair or interfere with the Conservation Values. Owner intends that this Notice (i) will assure that the Protected Mitigation Area will be used for such activities that are consistent with the purpose of this Notice, and (ii) shall be implemented consistent with the ARAP and DA Permit.

NOW, THEREFORE, in consideration of the foregoing, Owner hereby declares that the Protected Mitigation Area shall be held, sold, and conveyed subject to the following land use restrictions. Said land use restrictions shall run with the land and shall be binding on all parties having any right, title, or interest in the Protected Mitigation Area or any part thereof, their heirs, successors, successors-in-title, and assigns, and shall inure to the benefit of each owner thereof and to TDEC and USACE and the respective successors and assigns of such parties:

Land Use Restrictions: Any activity on or use of the Protected Mitigation Area inconsistent with the purpose of this Notice is prohibited. Without limiting the generality of the foregoing, the following activities and uses are expressly prohibited in, on, over, or under the Protected Mitigation Area.

1) **Destruction or Alteration.** There shall be no destruction or alteration of any part of the Protected Mitigation Area except as provided in Section 2.3.1 of the CMP.

2) **Livestock.** Livestock shall not be permitted to graze, inhabit, or otherwise enter the Protected Mitigation Area.

3) **Uses**. There shall be no commercial or industrial activity undertaken or allowed within the Protected Mitigation Area; nor shall any right of passage across or upon the Protected Mitigation Area be allowed or granted if that right of passage is used in conjunction with commercial or industrial

activity.

4) **Vegetation**. There shall be no removal, destruction, cutting, or spraying with biocides or other agrichemicals of any vegetation, nor any disturbance or change in the natural habitat in any manner, except (a) as otherwise provided in section 2.3.1 of the CMP and (b) activities (*e.g.*, invasive species eradication and access road upkeep) that are essential to the maintenance, management, or improvement of the Protected Mitigation Area as a protected natural area. There shall be no planting or introduction of any vegetation, except as described in the ARAP or DA Permit and as otherwise provided in the section 2.3.1 of the CMP.

5) **Topography**. Except as permitted under the ARAP or DA Permit, or as provided in section 2.3.1 of the CMP, there shall be no filling, excavating, dredging, mining, drilling, removal of topsoil, sand, gravel, rock, minerals or other materials, any dumping of ashes, garbage, or of any other material not required for the Protected Mitigation Area's maintenance as a protected natural area, nor granting or authorizing surface entry to the Protected Mitigation Area for any of these purposes, and no changing of the topography of the land in any manner, excepting activities (*e.g.*, wetland restoration, restorative streambank grading) that are essential for the management of the Protected Mitigation Area as a protected natural area.

6) **Building**. Within 100 feet of a stream that is the subject of an ARAP or DA permit, there shall be no construction or placing of buildings, mobile homes, advertising signs, billboards, or other structures, or additions or improvements to existing structures, excepting notice signs as required by the ARAP or DA Permit or reasonable signs related to the use of the Property as a park and golf course.

7) **Roads**. Except as permitted under the ARAP or DA Permit, or specifically provided in section 2.3.1 of the CMP, there shall be no building of new roads or any other rights of way, nor widening of existing roads or rights of way, excepting access routes and trails required for the management of the Protected Mitigation Area as a natural area.

8) **Waters**. Except as permitted under the ARAP or DA Permit, or specifically provided in section 2.3.1 of the CMP, within the Protected Mitigation Area there shall be no draining, ditching, diking, dredging, channelizing, damming, pumping, impounding, water withdrawals, or underground injection wells; no changing the grade or elevation, impairing or diverting the flow or circulation of waters, or reducing the reach of waters; and no other discharge or activity requiring a permit under applicable clean water or water pollution control laws and regulations, as amended.

9) **Resources**. There shall be no transfer, encumbrance, sale, lease, or other conveyance of the mineral, air or water rights for the Protected Mitigation Area and any portion thereof separate from the surface rights, changing the place or purpose of use of the water rights, abandoning or allowing the abandonment of, by action or inaction, any water or water rights, ditch or ditch rights, spring rights, reservoir or storage rights, wells, ground water rights, or other rights in and to the use of water historically

used on or otherwise appurtenant to the Protected Mitigation Area , including, but not limited to, (i) riparian water rights, (ii) appropriative water rights, (iii) rights to waters secured under contract with any irrigation or water district, to the extent such waters are customarily applied to the Protected Mitigation Area, and (iv) any water from wells that exist or may be constructed in the future on the Protected Mitigation Area .

10) **Vehicles**. There shall be no operation of dune buggies, motorcycles, or any recreational all-terrain vehicles, or any other types of motorized vehicles, excepting work vehicles (*e.g.*, tractors, backhoes, work trucks) required to maintain the Protected Mitigation Area as a protected natural area and trails specifically contemplated in section 2.3.1 of the CMP.

11) **Non-Native/Exotic Species.** There shall be no introduction of non-native or exotic species to the Protected Mitigation Area.

12) **Subdivision**. There shall be no legal or de facto division, subdivision, partitioning, or any other division of the portion of the Protected Mitigation Area.

13) **General.** There shall be no use of the Protected Mitigation Area which may adversely affect the purpose of this Notice or that violates or fails to comply with relevant federal, state, or local laws, regulations, or policies applicable to Owner, the Protected Mitigation Area, or the use or activity in question.

Other Provisions:

14) **Entrance and Inspection.** USACE and TDEC shall have the right to enter and inspect the Protected Mitigation Area and may enforce this Notice by means of a civil action.

15) **Enforcement.** Owner grants USACE and TDEC, as third party beneficiaries hereof, a discretionary right to enforce these land use restrictions in a judicial action against any person or other entity violating or attempting to violate these land use restrictions; provided, however, that no violation of these land use restrictions shall result in forfeiture or reversion of title. In any enforcement action, an enforcing agency shall be entitled to complete restoration for any violation, as well as any other remedy available under law or equity, such as injunctive relief and administrative, civil or criminal penalties. No omission or delay in acting by USACE or TDEC shall bar subsequent enforcement rights or constitute a waiver of any enforcement right. These enforcement rights are in addition to, and shall not limit, enforcement rights available under other provisions of law or equity, or under any applicable permit or certification. Nothing herein shall limit the right of USACE and TDEC to modify, suspend, or revoke the DA Permit or ARAP, respectively. Nothing herein shall be construed to authorize USACE or TDEC to institute proceedings against the Owner for changes to the Protected Mitigation Area due to acts of God, natural disasters, or unauthorized acts of third parties outside the control of Owner so long as the compensatory mitigation has been completed and determined by the USACE and TDEC to be successful in accordance with the ARAP and DA Permit.

16) **Costs of Ownership**. Owner retains all responsibilities and will bear all costs and liabilities of any kind related to the ownership, operation, upkeep, and maintenance of the Protected Mitigation Area. Owner remains solely responsible for obtaining any applicable governmental permits and approvals required for any activity or use permitted by this Notice. Owner agrees that neither USACE nor TDEC have any duty or responsibility for the operation, upkeep or maintenance of the Protected Mitigation Area, the monitoring of hazardous conditions on it, or the protection of Owner, the public, or any third parties from risks related to conditions on the Protected Mitigation Area.

17) **Filing**. Owner will record or cause this Notice to be recorded in the official land records of the Register of Deeds of Davidson County, Tennessee, as soon as practicable after execution of this instrument, and will provide USACE and TDEC a copy of the recorded instrument within thirty (30) days of recordation.

18) **Term**. This Notice shall run with and bind the Protected Mitigation Area in perpetuity unless/until this Notice shall be made less stringent or canceled as set forth under the paragraph entitled "Amendment and Termination."

19) **Amendment and Termination.** This Notice may only be waived, amended, modified, or terminated for cause by and upon the agreement of both the Commissioner of TDEC and the District Engineer of USACE. No amendment to this Notice shall be effective until such amendment or instrument terminating this Notice is recorded in the Register of Deeds Office for Davidson County, Tennessee. Additional compensatory mitigation may be required for impacts resulting from any amendment.

20) **Modifications**. Owner must provide sixty (60) days notice to TDEC and USACE prior to any action being taken that serves to void, modify, amend, or terminate this Notice.

21) **Severability.** Invalidation of any of these covenants or restrictions by judgment or court order shall in no way affect any other provisions, which shall remain in full force and effect.

22) **Title**. If any enforceable easement, right, interest, or lease on or to the Protected Mitigation Area is exercised in such a manner that conflicts with or voids the uses of the Protected Mitigation Area set out in this Notice, then Owner will be responsible for providing alternative compensatory mitigation in such amounts and of such resource type and function as USACE and TDEC or any enforcer of this Notice reasonably determines in accordance with the ARAP and DA Permit.

23) **Transfer and Assignment.** Owner shall include the following notice on all deeds, mortgages, plats, or any other legal instrument used to convey any interest in the Protected Mitigation Area :

> NOTICE: This Protected Mitigation Area is subject to a Notice of Land Use Restriction dated [*insert date of Declaration*], recorded in the [*insert County name*] Register of Deeds Office on [*insert date*

recorded] in Deed Book [*insert number*], Page [*insert number*] *[or Instrument Number,]* and enforceable by the Tennessee Department of Environment and Conservation and U.S. Army Corps of Engineers.

Owner shall provide USACE and TDEC with written notice of any transfer sixty (60) days prior to such transfer. The notice shall include the name, address, and telephone number of the prospective transferee, a copy of the proposed deed or other documentation evidencing the conveyance, and a survey map that shows the boundaries of the Protected Mitigation Area being transferred. The new transferee will provide USACE and TDEC a letter acknowledging the terms and conditions of this Notice. Failure to comply with this paragraph does not impair the validity or enforceability of this Notice.

24) **Other Permits**. Any permit application, or request for certification or modification, which may affect the Protected Mitigation Area, made to any governmental entity with authority over Waters of the United States or Waters of the State, must expressly reference and include a copy, with the recording stamp, of the terms of this Notice.

25) **Jurisdictional Waters**. The Protected Mitigation Area will remain protected even though it may later be determined, through case law decisions or otherwise, not to have jurisdictional Waters of the United States.

26) **General Disclaimer**. USACE, including its employees, agents, and assigns disclaim and will not be held responsible for Owner's negligent acts or omissions or Owner's breach of any representation, warranty, covenant, or agreements contained in this Notice, or violations of any federal, state, or local laws, including all environmental laws including, without limitation, those that give rise to liabilities, claims, demands, losses, expenses, damages, fines, fees, penalties, suits, proceedings, actions, costs of actions, or sanctions asserted by or on behalf of any person or governmental authority, and other liabilities (whether legal or equitable in nature and including court costs) to which USACE may be subject or incur relating to the Protected Mitigation Area .

27) **Notification.** Any notice, request for approval, or other communication required by these land use restrictions shall be sent by registered mail, pre-paid postage, to the following addresses (or such addresses as may be hereinafter specified by notice pursuant to this paragraph):

To Owner: Metropolitan Department of Parks and Recreation
2565 Park Plaza
Nashville, TN 37203

With copy to:

Metropolitan Department of Law
108 Metro Courthouse, Suite 108
P.O. Box 196300
Nashville, TN 37219

To USACE: U.S. Army Corps of Engineers
Attn: Regulatory Division Chief

For Nashville District:
3701 Bell Road
Nashville, Tennessee 37214

For Memphis District:
167 North Main, Room B-202
Memphis, Tennessee 38103-1894

To TDEC: TDEC, Division of Water Resources
Attn: Natural Resources Unit
William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 11th Floor
Nashville, Tennessee 37243

IN WITNESS WHEREOF, the Metropolitan Government of Nashville and Davidson County has caused this Notice of Land Use Restriction to be executed by its duly authorized representative(s) on this the _____ day of _____, 20__.

Metropolitan Government of
Nashville and Davidson County

By: _____

Name: _____

Title: _____

STATE OF TENNESSEE
COUNTY OF _____

Personally appeared before me, the undersigned Notary Public having authority within the aforesaid State, _____ , with whom I am personally acquainted (or proved to me on the basis of satisfactory evidence), and who acknowledged that he/she executed the within instrument for the purposes therein contained, and who further acknowledged that he/she is the _____ of the _____ Metropolitan Government of Nashville and Davidson County.

WITNESS my hand, at office, this _____day of _____, 20___.

_____
Notary Public

My Commission Expires: _____

Acknowledged By:

Tennessee Department of General Services

By: _____

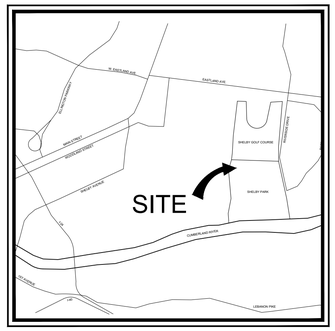
Name: _____

Title: _____

Exhibits should be on separate pages attached to this document.

EXHIBIT A – PROTECTED MITIGATION AREA

EXHIBIT B – COMPENSATORY MITIGATION PLAN

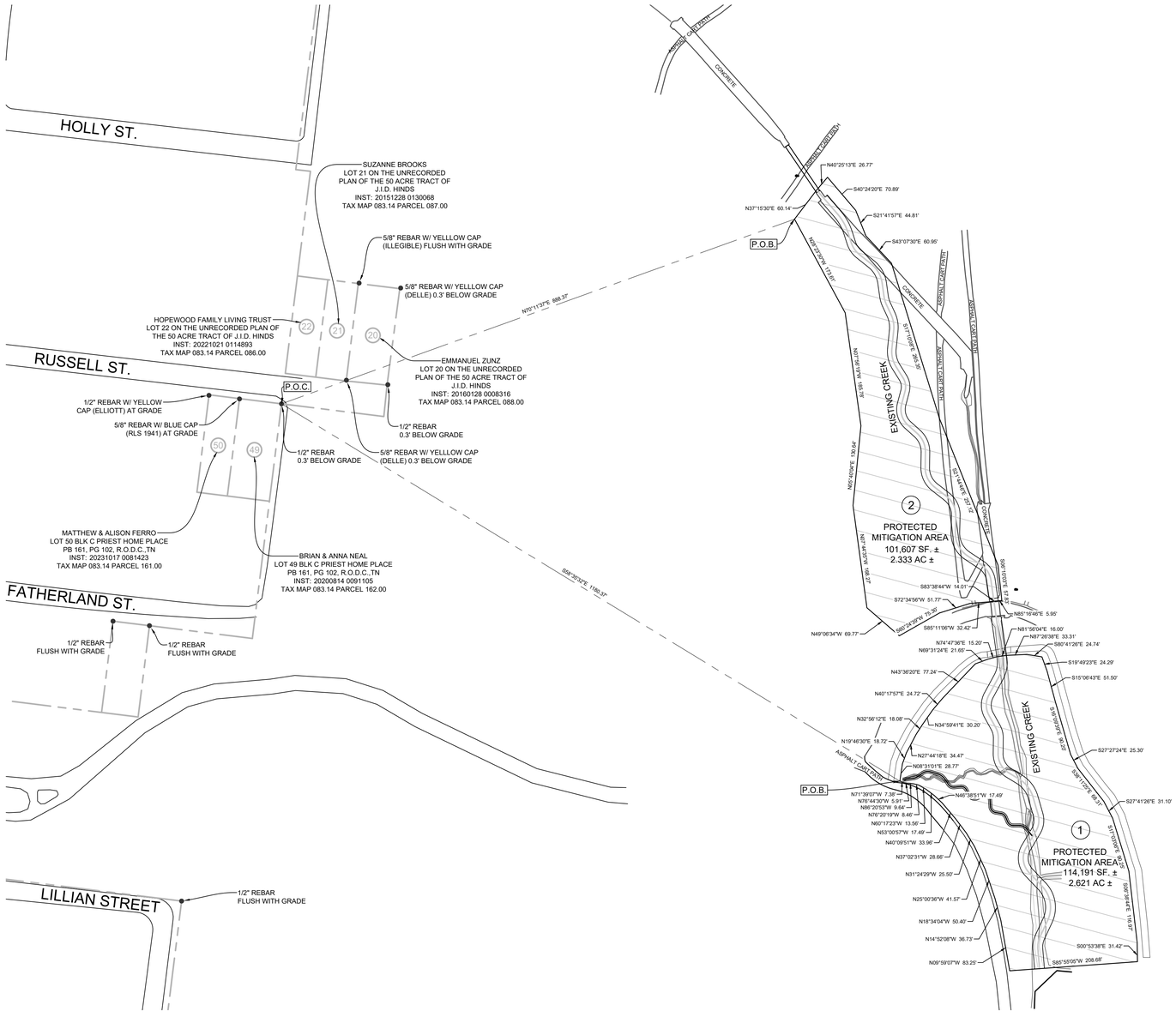


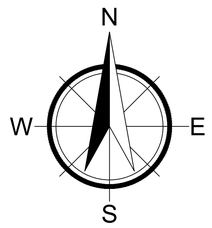
VICINITY MAP

NOT TO SCALE

NOTES:

1. This survey meets the requirements of a Remote Sensing Survey (Category IV) whose Root Mean Squared (RMS) values are not in excess of H (0.06') and V (0.06') at 1-sigma. These values are in accordance with the Standards of Practice [Rule 0820-03-.07(5)] adopted by The Board of Examiners for Land Surveyors, State of Tennessee.
2. Distances were corrected for temperature and barometric pressure.
3. The Horizontal Location data shown on this survey was gathered using Standard Radial Surveying Techniques with an Electronic Total Station and Data Collector and is based upon a Positional Solution derived from TDOT Global Positioning System (GPS) Observations and are represented in the Tennessee State Plane Coordinate System; NAD83 (Horizontal) and NAVD 88 (Vertical).
4. This survey was made using the latest recorded deeds/plats and based on physical evidence found. No Title Report was furnished to this surveyor, therefore, this survey is subject to the findings of a complete and accurate title search.
5. The surveyor's liability for this document shall be limited to those parties identified in the certification and does not extend to any unnamed party.
6. This is NOT an ALTA/NSPS Land Title Survey.
7. All distances shown are in feet and decimals thereof.
8. A portion of this property is located in an area designated as a "Special Flood Hazard Area" as per the Federal Emergency Management Agency "National Flood Insurance Program" Rate Map No. 47037C0261H. (Zones AE & X) shaded, (Map Revised April 05, 2017).
9. This surveyor has not physically located the underground utilities. Above grade and underground utilities shown were taken from visible appurtenances at the site, public records and/or maps prepared by others. Special attention has been taken to indicate the approximate nature of the utilities, shown hereon. The surveyor makes no guarantee that the underground utilities shown comprise all such utilities in the area, either in service or abandoned. The surveyor further does not warrant that the underground utilities are in the exact location indicated. Therefore, reliance upon the type, size, and location of utilities show, must be done so with this circumstance considered. Detailed verification of existence, location, and depth should also be made prior to any decision relative thereto is made. Availability and cost of service should be confirmed with the appropriate utility company. In Tennessee it is a requirement per "The Underground Utility Damage Prevention Act" that anyone who engages in excavation must notify all known underground utility owners, no less than three (3), nor no more than ten (10) working days prior to the date of their intent to excavate and also to avoid any possible hazard or conflict. (Tennessee One Call: 1-800-351-1111).
10. Subject property is of record in Deed Book 412, Page 130, in the Register of Deeds Office of Davidson County, Tennessee (R.O.D.C.,TN).
11. Subject property is shown on Tax Map No. 94.02 as Parcel 229.00 of the Davidson County, TN Planning Department's GIS website.





Tennessee State Plane
Coordinate System
Zone 5301, FIPS Zone 4100
Horizontal Datum: NAD83
Vertical Datum: NAVD88

0 50 100 200

SCALE 1" = 100'

SURVEY LEGEND
M.B.S.L. – MINIMUM BUILDING SETBACK LINE
C.M.P. – CORRUGATED METAL PIPE
D.B. – DEED BOOK
F.D.C. – FIRE DEPARTMENT CONNECTION
F.E.S. – FLARED END SECTION (STORM)
F.F.E. – FINISHED FLOOR ELEVATION
H.D.P.E. – HIGH DENSITY POLYETHYLENE
I.E. – INVERT ELEVATION
P.B. – PLAT BOOK
R.C.P. – REINFORCED CONCRETE PIPE
P.O.C. – POINT OF COMMENCEMENT
P.V.C. – POLYVINYL CHLORIDE PIPE
R.O.W. – RIGHT-OF-WAY
P.O.B. – POINT OF BEGINNING
TYP. – TYPICAL
PROPERTY CORNER FOUND– IR(F)
PROPERTY CORNER SET– IR(S)
CONCRETE MONUMENT FOUND C.M.(F)
ELEVATION BENCHMARK– BM
SURVEY CONTROL POINT
AIR CONDITIONING UNIT
CATCH BASIN
AREA DRAIN
CLEAN OUT
FIBER OPTIC MARKER
FIRE HYDRANT
GAS VALVE
GAS METER
GAS MARKER
GUY WIRE/ANCHOR
JUNCTION BOX
LIGHTPOLE
MANHOLE
SANITARY SEWER MANHOLE
TELEPHONE PEDESTAL
WEIR INLET
WATER METER
WATER VALVE
UTILITY POLE
TRANSMISSION UTILITY POLE
POWER TRANSFORMER
FENCE LINE – X –
OVERHEAD UTILITY – UTL –
OVERHEAD POWER – P –
UNDERGROUND POWER – P –
OVERHEAD TELEPHONE – T –
UNDERGROUND TELEPHONE – T –
TRAFFIC UTILITY – TR –
FIBER–OPTIC – FO –
NATURAL GAS – GAS –
FLOODPLAIN – FP –
SANITARY SEWER – SS –
SEWER FORCEMAIN – FM –
WATER LINE – W –

Certificate of Survey

I hereby certify that in my professional opinion, as a land surveyor registered in the State of Tennessee the within plat represents a survey made under my supervision in accordance with T.C.A Section 0820-3. The field work for this survey was completed on April 04, 2024.

Adam C. Bledsoe
Tennessee Registered Land Surveyor #3099
April 04, 2024

W&A Engineering
CIVIL ENGINEERING • LANDSCAPE ARCHITECTURE
SURVEYING • SOIL AND ENVIRONMENTAL CONSULTING
TRAFFIC ENGINEERING • ECONOMIC DEVELOPMENT
4101 Charlotte Ave., Suite E215
Nashville, TN 37209
P: (615) 610-1023
waengineering.com

EXHIBIT FOR PROTECTED MITIGATION AREAS

SHELBY PARK

NASHVILLE, DAVIDSON COUNTY, TENNESSEE

DATE: 04/05/24

REVISIONS

DATE	COMMENT
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ADAM C. BLEDSOE
REGISTERED LAND SURVEYOR
XVI SURVEY
AGRICULTURE
ENGINEERING
COMMERCE
TENNESSEE NO. 3099

Tennessee 811
Know what's below. Call before you dig.

EXHIBIT

DRAWN BY: DEW

W&A PROJECT #:
240143

SHEET 1 OF 1

W&A Engineering
CIVIL ENGINEERING • SURVEYING • LANDSCAPE ARCHITECTURE
TRAFFIC ENGINEERING • ECONOMIC DEVELOPMENT

Legal Description
Protected Mitigation Area 1

Being a tract of land to be used as a Protected Mitigation Area, located on lands now owned by the Metropolitan Government of Nashville Parks Department, Parcel ID 09402022900, of record in Deed Book 412, Page 130, Register's Office for Davidson County, Tennessee, and being more particularly described as follows:

Commencing at a 1/2" Rebar found in the southern margin of Russell Street, said rebar being the northeast corner of the Brian & Anna Neal property, Lot #49 of Block C, on the Plat for Priest Home Place, of record in Instrument number 20200814-0091105 (R.O.D.C.,TN), Plat Book 161, Page 102 (R.O.D.C.,TN), said rebar also being a point on the west line of the Metropolitan Government of Nashville Parks Department property;

thence, with a tie line S 58°35'32" E a distance of 1,180.37' to the **POINT OF BEGINNING**;

thence, N 08°31'01" E a distance of 28.77' to a point;
thence, N 19°46'30" E a distance of 18.72' to a point;
thence, N 27°44'18" E a distance of 34.47' to a point;
thence, N 32°56'12" E a distance of 18.08' to a point;
thence, N 34°59'41" E a distance of 30.20' to a point;
thence, N 40°17'57" E a distance of 24.72' to a point;
thence, N 43°36'20" E a distance of 77.24' to a point;
thence, N 69°31'24" E a distance of 21.65' to a point;
thence, N 74°47'36" E a distance of 15.20' to a point;
thence, N 81°56'04" E a distance of 16.00' to a point;
thence, N 87°26'38" E a distance of 33.31' to a point;
thence, S 80°41'26" E a distance of 24.74' to a point;
thence, S 19°49'23" E a distance of 24.29' to a point;
thence, S 15°06'43" E a distance of 51.50' to a point;
thence, S16°09'39" E a distance of 90.20' to a point;
thence, S 27°27'24" E a distance of 25.30' to a point;
thence, S 38°11'25" E a distance of 68.31' to a point;
thence, S 27°41'26" E a distance of 31.10' to a point;
thence, S 17°03'06" E a distance of 90.25' to a point;
thence, S 06°38'44" E a distance of 116.97' to a point;
thence, S 00°53'38" E a distance of 31.42' to a point;
thence, S 85°55'05" W a distance of 208.68' to a point;
thence, N 09°59'07" W a distance of 83.25' to a point;
thence, N 14°52'08" W a distance of 36.73' to a point;
thence, N 18°34'04" W a distance of 50.40' to a point;
thence, N 25°00'36" W a distance of 41.57' to a point;
thence, N 31°24'29" W a distance of 25.50' to a point;
thence, N 37°02'31" W a distance of 28.66' to a point;
thence, N 40°09'51" W a distance of 33.96' to a point;

thence, N 46°38’51” W a distance of 17.49’ to a point;
thence, N 53°00’57” W a distance of 17.49’ to a point;
thence, N 60°17’23” W a distance of 13.56’ to a point;
thence, N 76°20’19” W a distance of 8.46’ to a point;

thence, N 86°20’53” W a distance of 9.64’ to a point;
thence, N 76°44’30” W a distance of 5.91’ to a point;
thence, N 71°39’07” W a distance of 7.38’ to the **POINT OF BEGINNING.**
Containing 114,191 Sq Ft or 2.621 Acres, more or less.

Adam Bledsoe, RLS
TN License #3099

W&A Engineering
CIVIL ENGINEERING • SURVEYING • LANDSCAPE ARCHITECTURE
TRAFFIC ENGINEERING • ECONOMIC DEVELOPMENT

Legal Description
Protected Mitigation Area 2

Being a tract of land to be used as a Protected Mitigation Area, located on lands now owned by the Metropolitan Government of Nashville Parks Department, Parcel ID 09402022900, of record in Deed Book 412, Page 130, Register's Office for Davidson County, Tennessee, and being more particularly described as follows:

Commencing at a 1/2" Rebar found in the southern margin of Russell Street, said rebar being the northeast corner of the Brian & Anna Neal property, Lot #49 of Block C, on the Plat for Priest Home Place, of record in Instrument number 20200814-0091105 (R.O.D.C.,TN), Plat Book 161, Page 102 (R.O.D.C.,TN), said rebar also being a point on the west line of the Metropolitan Government of Nashville Parks Department property;

thence, with a tie line, N70°11'37" E a distance of 888.37' to the **POINT OF BEGINNING**;

thence, N 37°15'30" E a distance of 60.14' to a point;
thence, N 40°25'13" E a distance of 26.77' to a point;
thence, S 40°24'20" E a distance of 70.89' to a point;
thence, S 21°41'57" E a distance of 44.81' to a point;
thence, S 43°07'30" E a distance of 60.95' to a point;
thence, S 17°10'08" E a distance of 265.35' to a point;
thence, S 21°44'46" E a distance of 257.12' to a point;
thence, S 06°10'03" E a distance of 57.83' to a point;
thence, S 85°16'46 W a distance of 5.95' to a point;
thence, S 83°38'44" W a distance of 14.01' to a point;
thence, S 85°11'06" W a distance of 32.42' to a point;
thence, S 72°34'56" W a distance of 51.77' to a point;
thence, S 60°24'39" W a distance of 75.30' to a point;
thence, N 49°06'34" W a distance of 69.77' to a point;
thence, N 07°44'35" W a distance of 168.27' to a point;
thence, N 05°40'04" E a distance of 130.64' to a point;
thence, N 07°56'19" W a distance of 185.78' to a point;
thence, N 28°23'30" W a distance of 173.61' to the **POINT OF BEGINNING.**
Containing 101,607 Sq Ft or 2.333 Acres, more or less.

Adam Bledsoe, RLS
TN License #3099

Lockeland Springs Permittee Responsible Compensatory Mitigation Plan

Lockeland Springs Permittee Responsible Mitigation Project

Shelby Park and Golf Course - Nashville, Tennessee

Lower Cumberland-Sycamore (HUC 05130202)

USACE # LRN-2023-00794

TDEC # NRS23.274C

Prepared For:

Nashville Metro Water Services

Prepared By:

KCI Technologies

May 16, 2024

Executive Summary

Nashville Metro Water Services has requested KCI develop a Permittee Responsible Mitigation Plan for the Lockeland Springs Stream Restoration project located in Shelby Park in Nashville, TN. This mitigation plan is being executed to offset unavoidable stream impacts associated with the expansion of the Omohundro water treatment facility located less than a mile south of the Lockeland Springs restoration site. The proposed stream restoration project involves the restoration of approximately 1,500 linear feet of channel along two unnamed tributaries to the Cumberland River: Unnamed Tributary 1 (UT1) and Unnamed Tributary 2 (UT2).

The upper reach of UT1 exists as a concrete-lined, straightened channel within Shelby Golf Course. Perennial flow often bypasses the channel and flows subsurface resulting in poor ecological function and habitat loss. Downstream within Shelby Park, UT1 has been straightened and channelized before emptying into Sevier Lake. Both reaches of UT1 possess high restoration potential given these historical alterations. UT2 is a small, headwater stream that enters UT1 from the west within Shelby Park. This tributary exhibits better ecological function than the main channel, but it was also altered by road and greenway infrastructure at one time. Land use within the project watershed is dominated by impervious and open land. The restoration of the tributaries will include implementing a riparian buffer to provide long-term protection to natural resources within a heavily altered landscape. A new dimension, pattern, and profile will be constructed for all stream reaches. The proposed plan, profile, and instream structures will improve habitat quality. The newly planted riparian buffer will provide shade to the channel and become a natural source of dead woody debris and organic matter for the project streams. The riparian zone surrounding UT1 and UT2 will be planted with trees, shrubs, and seeded with native herbaceous species.

As proposed, the restoration of UT1 and UT2 will generate 582 functional credits which will offset the 491 debits associated with the water treatment expansion.

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APPENDICES

1.0 BASIC INFORMATION

1.1. DA PERMIT NUMBER

This compensatory mitigation plan is being submitted in support of USACE Permit LRN-2023-00794 and TDEC Permit NRS23.274.

1.2. APPLICANT

Nashville Metro Water Services
1400 Pumping Station Road
Nashville, Tennessee 37210

Contact:
Cody Mitchell (Permitting Agent) | Project Manager
Jacobs Engineering Group
1801 West End Avenue, Nashville, TN 37203
p. 931-235-1546
Cody.Mitchell@jacobs.com

1.3. AGENT

The applicant and their permitting agent will coordinate all permitting efforts with the respective regulatory agencies for this project. The consultant preparing this mitigation plan and conducting the mitigation design is KCI Technologies. The KCI project team is described below. KCI has developed several Permittee Responsible Mitigation Plans and stream restoration designs throughout the State of Tennessee. KCI is also a Bank Sponsor for several stream and wetland mitigation banks in Tennessee, North Carolina, Maryland, and Wisconsin.

Josh Sitz, TN-QHP – Project Manager
Mr. Sitz is a project manager in KCI's Nashville, TN office and has a professional and academic background that covers stream assessment, stream biology, stream functional processes, and stream restoration construction. He has been working with KCI for over eleven years. During that time, he has gained experience in all aspects of stream restoration while working on projects in a variety of settings throughout Tennessee. Mr. Sitz is a Qualified Hydrologic Professional and possesses a Rosgen Level 3 certification.

Evan White, EIT– Design Engineer
Mr. White is a design engineer in KCI's Nashville, TN office. He has a professional and academic background in environmental engineering. He has been working with KCI for one year, specializing in the assessment, monitoring, and design of stream restoration and dam removal projects throughout Tennessee. Mr. White has a TNEPSC Level 1 certification.

Timothy Guess, TN-QHP-IT – Scientist
Mr. Guess is a scientist in KCI's Nashville, TN office. He has been working with KCI for two years performing stream assessment and monitoring as well as site maintenance. He has a professional and

academic background in watershed assessment, wetland delineation, and stream habitat assessment. Mr. Guess possesses a Qualified Hydrologic Professional In-Training certification.

1.4. IMPACT SITE

Table 1. Impact Site Details

City, County, State	Nashville, Davidson County, TN
HUC-8	Cheatham Lake – 05130202
HUC-12	Cumberland River-Browns Creek – 051302020305
Level III Ecoregion	Interior Plateau (71)
Level IV Ecoregion	Outer Nashville Basin (71h)
Closest Intersection (Stream 1)	Omohundro Drive and Visco Drive
Coordinates (Stream 1)	36.159022, -86.726558

Table 2. Lockeland Springs PRM Restoration Site Details

City, County, State	Nashville, Davidson County, TN
HUC-8	Cheatham Lake – 05130202
HUC-12	Cumberland River-Browns Creek – 051302020305
Level III Ecoregion	Interior Plateau (71)
Level IV Ecoregion	Outer Nashville Basin (71h)
Closest Intersection (UT1)	Shelby Park Drive and Reflection Way
Coordinates (UT1)	36.174686, -86.732116

Due to the required footprint of a new intake structure at the Omohundro Water Treatment Plant, approximately 982 linear feet of Stream 1 will be encapsulated (Tier 5 Impact). The Existing Condition Score (ECS) for Stream 1 is 0.57, and unavoidable impacts to the stream associated with the water treatment expansion are anticipated to require 491 functional credits according to the TN Debit Tool. Stream 1 has been assessed by TDEC as not supporting for its designated use of Fish and Aquatic Life (Monitoring Station CUMBE193.4T0.4DA). See NRS23.274 and LRN-2023-00794 permit packages for more details regarding Stream 1 impacts.

The applicant proposes to offset the stream impacts through Permittee Responsible Mitigation by restoring two unnamed tributaries located within Shelby Park in Nashville, TN. The restoration of UT1 and UT2 will generate 582 functional credits which will offset the 491 debits associated with the water treatment expansion. The following sections outline the mitigation design and the ecological lift it will provide.

2.0 MITIGATION PLAN

2.1. PROJECT GOALS

The purpose of this project is to improve stream function along two degraded unnamed tributaries to account for unavoidable impacts to Stream 1 at the Omohundro Water Treatment Plant in Nashville, Davidson County, Tennessee. This will occur by restoring natural stream processes to UT1 and UT2

which have been lost due to historic alterations to their natural pattern, profile and dimension. The proposed stream restoration project will restore 1,252 linear feet of UT1 and 228 linear feet of UT2. The existing streams were assessed using the Tennessee Stream Quantification Tool (SQT). According to the baseline assessments, both streams are not functioning in several of the assessed parameters. The restoration design will aim to correct the functional deficiencies identified by the geomorphic assessment where possible. The following table outlines the project goals and objectives.

Table 3. Project Goals and Objectives

Reach	Goal	Function-based Parameter	Objectives
All Project Streams	Maintain the transport of water in the channel, on the floodplain, and through sediments.	Floodplain Connectivity	Create a restored channel with a weighted bank height ratio of 1.0-1.2 and an entrenchment ratio of 2.2 or greater.
	Improve the quality of instream habitat by reducing sediment inputs from stream bank erosion.	Lateral Migration	Restore a channel that can remain stable given the existing hydrologic regime with less than 10% bank erosion and a BEHI/NBS rating of L/VL, L/L, L/M, or M/VL.
	Improve the quality of the riparian buffer surrounding the stream.	Riparian Vegetation	Restore a riparian buffer where the Average Index Value for Riparian Vegetation is ≥ 0.70 and invasive coverage is < 5%.
	Improve the transport of wood to create diverse bed forms and serve as aquatic refuge.	Large Woody Debris	Restore a channel with woody debris incorporated in the instream structures and create a riparian buffer with streamside vegetation to serve as a source for woody debris in the future. The restored stream should have a LWDI of ≥ 179.
	Improve habitat diversity through consistent riffle-pool sequencing throughout the reach.	Bedform Diversity	Restore a channel that is comprised of 23.9-56.1% riffle habitat, a pool spacing ratio of 3.0-5.0, and a pool depth ratio of ≥ 2.0.

2.2. SITE SELECTION

Several factors were considered when selecting this mitigation site. The restoration potential of both UT1 and UT2 given their degraded condition was a primary consideration. Another factor during the selection process included proximity to the impacts. The selected site provides an opportunity to provide significant ecological lift within the same HUC12 watershed as the impact to Stream 1.

2.2.1 WATERSHED OVERVIEW

The project site is located in an urban setting within the Interior Plateau Level III Ecoregion 71. The HUC8 is 05130202 and the HUC12 is 051302020305 (Cumberland River – Browns Creek). The drainage area of the project streams is approximately 1.1 square miles at the downstream project limits. The watershed is dominated by the Maury-Urban Land Complex soil type, with lesser amounts of Stiversville-Urban Land Complex and trace amounts of Lindell-Urban Land Complex. However, the Stiversville-Urban Land Complex dominates the project area. The most extensive type of land cover in the contributing drainage area is open/disturbed urban vegetation (56%) which includes residential

lawns and the golf course, followed by impervious urban development (25%) which includes streets, buildings, driveways, and parking lots. The remainder of the land cover (19%) is forest. As described earlier in this document, the watershed is urban residential and is not likely to experience additional development/urbanization in the future due to limited land availability. Maps identifying local watershed characteristics are included in **Appendix A** of this mitigation plan.

2.2.2 SITE CONSTRAINTS

A constraints analysis of the selected mitigation site identified multiple infrastructure-related constraints. Restoring UT1 requires crossing an existing sewer line in two locations, one in each reach. The restored streams vertical profiles are also dictated by the existing culvert inverts that will remain in place. Another design constraint included an existing walking path and span bridge located in UT1 Reach 2. While each of these features had an effect on the design, they do not inhibit project success and the goal of providing significant functional lift to the project streams.

2.2.3 ADDITIONAL SITE SELECTION CRITERIA

Not applicable for onsite mitigation projects.

2.3 SITE PROTECTION INSTRUMENT

This site will be protected through the execution of a Land Use Restriction Agreement. A draft template of the Land Use Restriction Agreement is included in **Appendix F**. A completed version of all site protection instrument documents will be provided in the Final Mitigation Plan.

2.3.1 SITE PROTECTION

The restored streams will be protected in perpetuity as documented in the Land Use Restriction Agreement located in **Appendix F**. The protected area will be posted with boundary markers every 100 linear feet to allow natural regeneration and to protect the stream and planted riparian vegetation. Over the course of the monitoring and adaptive management phase, the applicant or an assigned agent will conduct annual site visits to ensure that these practices are being followed in the restoration area. Following the monitoring and adaptive management phase, the project's long-term steward will ensure land use restrictions are adhered to as described in the Long-Term Management Plan. The following identifies key exemptions to prohibited uses and restrictions within the site protection instrument regarding Shelby Park and Shelby Golf Course maintenance and management:

<u>Key Exemptions to Prohibited Uses and Restrictions</u>

- Metro Parks reserves the right to remove overstory and midstory volunteer tree species from Planting Zone 4 (See Planting Plan in **Appendix E**) as necessary for golf course management purposes. All planted understory shrub species shall remain protected.
- Metro Parks reserves the right to construct and maintain a 3-foot wide primitive hiking trail. Trails and associated maintenance shall not occur within 25 feet of the restored stream's top of bank.
- Metro Parks reserves the right to place or remove clean fill material within the protected mitigation area as long as it is located more than 25' from the restored stream's top of bank and does not affect any jurisdictional Waters of the State and/or Waters of the U.S.
- Metro Parks reserves the right to continue engaging in good park and golf course management and maintenance, including watering as appropriate. These practices will be completed as to not negatively impact Waters of the State and/or Waters of the U.S. or result in degradation of water quality.

2.4 BASELINE INFORMATION

2.4.1 LOCATION DESCRIPTION

See Section 1.4 in this Mitigation Plan.

2.4.2 MAPS

Maps have been prepared to illustrate the onsite aquatic resources, site characteristics, aerial imagery, and boundaries of the mitigation site. These maps are available in **Appendix A.**

2.4.3 BASELINE STREAM ASSESSMENT

2.4.3.1 WATERSHED ASSESSMENT FORM

The Watershed Assessment Form was completed for the project stream as a part of the Stream Quantification Tool. The assessment form is available in **Appendix B**.

2.4.3.2 EXISTING REACH-LEVEL BASED STREAM QUANTIFICATION TOOL DATA FORM

An Existing and Proposed Reach-Level Field Based Stream Quantification Tool Workbook was completed for the project streams and is located in **Appendix B.** The following table summarizes the existing conditions in terms of function for UT1 Reach 1, UT1 Reach 2, and UT2.

Table 4. Summary of Existing Function Based Assessments

Reach	Catchment Hydrology	Reach Runoff	Floodplain Connectivity	Large Woody Debris	Lateral Migration	Riparian Vegetation	Bedform Diversity	Sinuosity	%NUTOL	TMI
UT1 Reach 1	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
UT1 Reach 2	NF	FAR	NF	NF	NF	FAR	FAR	NF	FAR	NF
UT2	FAR	F	F	NF	FAR	FAR	NF	NF	FAR	NF

Based on analysis of the functional assessment data, there is an opportunity for functional lift primarily related to stream hydraulics and geomorphology.

2.4.3.3 FUNCTIONAL ASSESSMENT DATA FORMS

A Rapid functional assessment data form was completed for the project stream and is located in **Appendix C.**

The existing and proposed project reach were classified using the Rosgen stream classification system. **Table 4** lists the existing and proposed stream types for the restoration project.

Table 5. Existing and Proposed Stream Types

Stream	Existing Stream Type	Proposed Stream Type
UT1 Reach 1	**N/A (Oversized Concrete Conveyance)**	**C4**
UT1 Reach 2	**G4c**	**C4**
UT2	**E6b**	**C4**

2.4.3.4 BIOLOGICAL DATA

The project streams have not been assessed by TDEC. A benthic macroinvertebrate sample was collected in 2024 by KCI staff and data analysis was completed by Aquatic Resources Center in Nashville, TN. One SQSH sample was collected on UT1 Reach 2 which produced a TMI of 18. See **Appendix C** for supporting biological data.

2.4.3.5 SITE PHOTOS

Site photos were collected during the baseline assessment to document existing site conditions. Project photos and a photo location map are located in **Appendix D**.

2.4.3.6 ADJACENT LAND USES SURROUNDING THE PROJECT SITE

The adjacent land use surrounding the project stream is mainly open grass area associated with the golf course, impervious roadways, and forest. The area immediately surrounding the stream will be planted and preserved as natural area. See the maps in **Appendix A** for aerial views the project location.

2.4.4 ADDITIONAL FACTORS TO CONSIDER DURING BASELINE DATA COLLECTION

A desktop review was conducted to assess the potential impact the project may have on threatened and endangered species and historic/cultural resources. A review of the USFWS database identified multiple species known to occur within the area. No critical habitats exist within or near the project boundary. A complete list of species identified in the USFWS IPAC report is included in **Appendix H**. The restoration of UT1 and UT2 is not likely to affect federally protected species and may only provide additional habitat for some in the long-term. Similarly, the site is located within a public park and golf course and historical or cultural resources are not likely to be impacted. According to the State Historic Preservation Office and Tennessee Historical Commission data viewer, Shelby Park is listed as a historic feature (DV-25427).

2.5 DETERMINATION OF CREDITS

The restoration of UT1 and UT2 is anticipated to generate 582 functional credits by addressing stream deficiencies associated with the channelization and straightening of the project streams. The table below summarizes the proposed credit generation for each stream reach.

Table 6. Credit Summary

Stream Name	Existing Length (lf)	Proposed Length (lf)	Functional Credits
UT1 Reach 1	762.2	701.7[1]	357.8[2]
UT1 Reach 2	515.4	550.0[1]	183.4[2]
UT2	208.2	228.3[1]	40.7
Total	1485.8	1480.0[3]	582.0

Note 1: Proposed length calculations exclude any stream length located within a utility easement or within 25' of existing culverts.
Note 2: Includes 5% increase in functional credits due to adjacent wetlands.
Note 3: This total represents the creditable length of stream channel after deductions. Total constructed length will be approximately 1,705'.

2.5.1 RESOURCE COMPENSATION

As described in Section 1.4, stream impacts associated with the expansion of the Omohundro Water Treatment Plant require 491 stream credits to offset the encapsulation of Stream 1. See NRS23.274 and LRN-2023-00794 permit packages for details regarding Stream 1 impacts. As proposed, the restoration of UT1 and UT2 exceeds the mitigation need for Stream 1 impacts. The following section details the functional lift associated with each project reach.

2.5.2 FUNCTIONAL LIFT

The functional assessment for this project included two reaches along UT1 and one reach on UT2. The assessment identified several opportunities for functional lift, primarily in the hydraulic and geomorphology function-based parameters. Functional lift within the hydrology functional category provides less opportunities for uplift as it is limited by the inability to alter large areas of the watershed due to the project extent. The restoration of both UT1 and UT2 aims to correct the functional deficiencies related to channel hydraulics and geomorphology through the implementation of a new pattern, dimension and profile. The existing and proposed field values for each reach can be found in the Stream Quantification Tool Workbook in **Appendix B**. Functional lift attainable for each project stream is described below.

UT1 Reach 1 is currently confined within a concrete ditch that functions more as a stormwater conveyance than a stream. As a result, all function-based categories have an existing rating of Not Functioning with most parameters exhibiting no stream function. The Existing Condition Score (ECS) for the reach is 0.05. The channel exists largely as a single concrete riffle lacking natural substrate or habitat for aquatic colonization. The restoration of this reach will include implementing riffle-pool sequences to improve instream habitat diversity and velocity/depth regime variability. Functional lift will be achieved by implementing a meandering stream with 30-50% riffle habitat, pool depth variability and a median pool spacing ratio between 3.0-5.0. Instream structures will include rock

riffles, vegetated soil lifts, and wood toe protection which will improve large woody debris habitat. The existing channel is also located within a golf fairway resulting in poor streamside vegetation and subsequently no large woody debris habitat. Vegetative lift will be achieved by establishing a riparian buffer on both the left and right bank with a tree density of 300 trees/acre (right bank only), a shrub coverage of approximately 25 percent, and native herbaceous coverage of 80 percent. The average buffer width on the left bank will be 29 feet and the average buffer width on the right bank will be 103 feet. The newly planted stream buffer will help maintain bank erosion rates that are <5% of the total bank length and will serve as a long-term source for large woody debris, detritus, and shade to the restored channel. The proposed riparian vegetation parameter will have a PCS near 0.63. By returning the stream to a natural meandering channel, the proposed design for UT1 Reach 1 will result in a PCS of 0.54 which is a 0.49 increase from its existing condition.

UT1 Reach 2 is a straightened, channelized stream for its entire length resulting in poor floodplain connectivity, lateral stability and bedform diversity. Evidence of bank armoring is prevalent throughout the reach. Until recently, the riparian buffer was regularly maintained to the top of bank. Chinese privet lines both banks and the riparian buffer now consists of herbaceous plants throughout the majority of the reach. Hydraulic and geomorphic survey data shows the stream is both incised and entrenched resulting in an ECS of 0.00 for the hydraulic functional category. Functional lift associated with floodplain connectivity will be attained by constructing a channel with a bank height ratio of 1.0 and an entrenchment ratio of 5.0. The resulting PCS for the hydraulics category is anticipated to be 1.0. Geomorphology uplift will be achieved by incorporating large woody debris into instream structures, adding geomorphic pools through riffle-pool sequencing to improve the pool spacing ratio, and planting a wide riparian buffer with native trees, shrubs and herbaceous plants. The geomorphology condition score is anticipated to increase from 0.23 to 0.69 providing signification functional lift to the stream reach. The proposed design for UT1 Reach 2 will result in an overall PCS of 0.58 which is a 0.30 increase from its existing condition.

UT2 is a small headwater stream that was straightened at the same time as UT1 Reach 2. The proposed design of the tributary focuses on reestablishing a more naturally meandering planform and subsequently improving bedform diversity, instream habitat, and lateral migration. While the hydraulics functional category is currently functioning with an ECS of 1.0, there is opportunity for significant lift related to the large woody debris, lateral migration, riparian vegetation, and bedform diversity parameters. UT2 currently has an overall ECS of 0.26 for the geomorphology functional category. This is largely due to the reach being riffle dominated with little depth/velocity variability. The absence of large wood within the channel, poor sinuosity, and lateral instability are also major contributors to the poor ecological function of the stream. The proposed design will incorporate large wood into the stream through the implementation of wood toe with vegetated soil lift structures, which will provide instream habitat and bank stability. Riffle-pool sequencing will restore pool spacing, riffle percentage, and depth variability to achieve a PCS of 1.0 for the bedform diversity parameters. The designed planform provides additional lift by increasing the sinuosity from 1.0 to 1.2. Vegetative lift will be achieved by establishing a riparian buffer on both the left and right bank with a tree density of 300 trees/acre, a shrub coverage of approximately 25 percent, and native herbaceous coverage of 80 percent. The average buffer width on the left bank will be 100 feet and the average buffer width on the right bank will be 69 feet. The newly planted stream buffer will help maintain bank erosion rates that are <5% of the total bank length and will serve as a long-term source for large woody debris, detritus, and shade to the restored channel. The proposed design for UT2 will result in an overall PCS of 0.68 which is a 0.13 increase from its existing condition.

See **Table 7** for a summary of existing and proposed stream function associated with the restoration of UT1 and UT2. The SQT Workbook identifying the functional lift associated with this mitigation approach is located in **Appendix B**.

Table 7. Stream Function Summary Table

Stream Function Summary Information					
Feature Restored	**Existing Stream Length (ft)**	**Proposed Stream Length (ft)[1]**	**Existing Condition Score**	**Proposed Condition Score**	**Change in Functional Condition**
UT1 Reach 1	762.2	701.7	0.05	0.54	0.49
UT1 Reach 2	515.4	550.0	0.28	0.58	0.30
UT2	208.3	228.3	0.55	0.68	0.13
Total Change in Functional Condition					**0.92**

Note 1: Proposed length calculations exclude any stream length located within a utility easement or within 25' of existing culverts. This total also represents the creditable length of stream channel after deductions. Total constructed length will be approximately 1,705'.

2.6 MITIGATION WORK PLAN

2.6.1 GENERAL WORK PLAN CONSIDERATIONS

2.6.1.1 SOIL COMPACTION

Soil compaction that occurs during construction will be alleviated through mechanical ripping before the riparian area is planted with woody species and permanent seeding is completed. Additionally, soil amendments may be applied during both the temporary and permanent seeding stages.

2.6.1.2 SPECIES COMPOSITION/SELECTION

A mix of native species was selected to be planted within the riparian zone that represents multiple strata and succession stages. See the plan sheets in **Appendix E** for the list of species to be planted within the riparian zones.

2.6.1.3 LAND DISTURBANCE

UT1 and UT2 will undergo significant grading to achieve project goals. Topsoil will be stockpiled from the excavation of the new channel and reused by mixing the soil into the surface of the disturbed soils where any excavation below existing grade is required. If any banks are to be created (such as with vegetated soil lift structures) this topsoil will be used to increase the likelihood of vegetative success along the channel. All appropriate sediment and erosion control measures will be utilized when constructing the channel and stockpiling materials. This will include temporary seeding, silt fence, and other necessary control measures. Stockpiled material may include topsoil and excess spoil to be removed from the site. If not reused at the project site, any spoil, waste, or other materials removed from the site will be taken to an approved location. All land disturbance will follow the approved sediment and erosion control plan.

2.6.2. STREAM MITIGATION

2.6.2.1. MITIGATION APPROACH

The mitigation work at the project site will focus on offline stream restoration. The stream design utilized a natural channel design approach based on onsite bankfull indicators as well as regional curve hydraulic and geomorphic relationships. Morphological data from the existing streams and the proposed functional values can be found in the baseline ecological assessment information in **Appendix C**.

The stream design incorporates habitat features such as structure with woody debris components. These features will be added to the project streams as a component of the geomorphological functional lift that the project will provide. The following paragraphs outline the mitigation approach for each stream and how the project will provide significant functional lift to the degraded system.

UT1 Reach 1 begins at the northern limits of the project as it exits a 24" concrete pipe. The stream flows south approximately 762 linear feet through Shelby Golf Course where it enters a large box culvert at Shelby Park Drive and transitions to UT1 Reach 2. UT1 Reach 1 is a straight, channelized concrete conveyance lacking any stream function. Perennial flow often undercuts the concrete and flows subsurface through large portions of the reach preventing aquatic colonization by macroinvertebrates and fish. Although the upstream sediment supply is low given the urbanized watershed, any transported sediment remains suspended during high flow events due to the constant slope and lack of bedform diversity. The restoration of UT1 Reach 1 will follow a Priority I restoration approach throughout the reach. The channel will meander to the west of its current position in order to increase sinuosity and riparian buffer area. UT1 Reach 2 begins as the stream exits the box culvert beneath Shelby Park Drive and flows south approximately 660 linear feet before entering Sevier Lake. This reach functions poorly due to past channelization and exists as a Rosgen G type channel with no floodplain access. While the bed of the channel will be raised in some areas, a Priority II restoration approach will also be used due to the vertical tie-outs. Cobble riffles, wood toe, boulder clusters, and live lifts will be utilized in the reach to improve instream habitat while providing bed and bank stability. The channel will have a new dimension, planform, and profile through the center of the valley. The new stream will be constructed offline in some areas while also meandering across the existing channel to utilize the full width of the valley floor.

UT2 is a small headwater stream that flows along Shelby Park Drive before entering a culvert and flowing into Shelby Park where the restoration begins to the west of UT1 Reach 2. The tributary will be restored to the south of its current position following a combination of Priority I and II approaches. The restoration of the stream will include designing and constructing a new planform, profile, and dimension. The majority of the stream will be constructed offline, but the start of the restoration will require crossing the existing channel. The restoration of the channel will focus on reducing streambank erosion and improving bedform diversity by implementing riffles and wood toe structures in outer meanders.

The following section outlines the design parameters selected for the mitigation approach for each project stream compared to existing conditions and Ecoregion 71 Regional Curve reference data.

2.6.2.2. DESIGN

The proposed restoration was completed using standard natural channel design techniques. These techniques were adapted to suit the conditions of the stream using the dimensionless ratios developed in the Ecoregion 71 regression analysis and the SQT morphology metrics. The geomorphic assessment of UT1 Reach 2 and UT2 found several bankfull indicators in the riffle dominated reaches. A bankfull discharge was developed using onsite riffle cross-section data that were determined to be an accurate hydraulic representation of the site. The project stream is designed as a transport channel such that any sediment that enters the channel, likely small gravel, sand, and suspended sediments, will move through the reach and the bed will not aggrade. The project reaches will have stable riffles composed of gravel and cobble material. Some of the void space will likely become filled with sand, silt, and clay particles but the structural riffle material will not actively transport. A Rosgen C4 stream type was chosen for both project streams to accommodate the tie out locations while maintaining a wide flood prone area and connection to a floodplain. A combination of Priority I and Priority II restoration will be utilized. Design plans depicting the stream planform, typical cross-sections, stream profile, and structure details are included in **Appendix E**. Design morphology tables for the project reaches are provided below.

Table 8. UT1 Stream Morphology Table

Variables		Existing		UT1 R1 Design Reference: Ecoregion 71 Regional Curve	UT2 R2 Design Reference: Ecoregion 71 Regional Curve	Proposed	
		UT1 R1	UT1 R2			UT1 R1	UT1 R2
Rosgen Stream Type		N/A Concrete Conveyance	G4c	*	*	C	C
Drainage Area (mi^2)		*	1.08	0.9	1.08	0.9	1.08
Bankfull Width (W_{bkf}) (ft)		*	12.2	18.9	20.3	14.0	16
Bankfull Mean Depth (d_{bkf}) (ft)		*	1.2	1.2	1.3	1.0	1.0
Bankfull Cross Sectional Area (A_{bkf}) (ft^2)		*	14.7	22.4	25.9	13.7	16.5
Width/depth Ratio (W_{bkf}/d_{bkf})		*	10.1	15.7	15.9	14.3	15.5
Maximum Depth (d_{mbkf}) (ft)		*	1.5	*	*	1.4	1.4
Width of flood prone area (W_{fpa}) (ft)		*	99.9	*	*	>70.0	>80.0
Entrenchment Ratio (ER)		*	1.7	*	*	≥ 5.0	≥ 5.0
Sinuosity (stream length/valley length) (K)		*	1.1	*	*	1.1	1.2
Dimension	Pool Depth (ft)	*	*	*	*	2.5	2.5
	Riffle Depth (ft)	*	1.5	*	*	1.4	1.4
	Pool Width (ft)	*	*	*	*	19.0	21.0
	Riffle Width (ft)	*	12.1	*	*	14.0	16.0
	Pool XS Area (sf)	*	*	*	*	30.0	35.0
	Riffle XS Area (sf)	*	14.7	22.4	25.9	13.7	16.5
	Bank Height Ratio	*	2.4	*	*	1.0	1.0
	Mean Bankfull Velocity (V) (fps)	*	2.9	*	*	4.2	3.6
	Bankfull Discharge (Q) (cfs)	*	42.6	82.9	96.2	57.0	59.0
Pattern	Meander length (L_m) (ft)	*	*	58.5-188.6	63.1-203.4	50.6-73.2	115.2-152.6
	Radius of curvature (R_c) (ft)	*	*	28.3-79.2	30.5-85.4	35.0-57.0	42.0-58.0
	Belt width (W_{blt}) (ft)	*	*	32.1-64.1	34.6-69.2	17.0-37.3	23.1-56.6
	Meander width ratio (W_{blt}/W_{bkf})	*	*	1.7-3.4	1.7-3.4	1.2-2.7	1.4-3.1
	Radius of curvature/bankfull width	*	*	1.5-4.2	1.5-4.2	1.5-4.1	1.7-4.1
	Meander length/bankfull width	*	*	3.1-10.0	3.1-10.0	3.6-5.2	7.2-9.5
Profile	Average water surface slope	*	0.004	*	*	0.010	0.007
	Pool spacing	*	51.5-73.0	56.6-94.3	61.0-101.7	23.10-37.8	49.0-82.7
	Riffle slope/avg water surface slope	*	2.2-3.5	0.8-3.9	0.8-3.9	0.01-0.05	0.7-4.4
	Pool length/bankfull width	*	0.9-3.3	0.8-6.2	0.8-6.2	1.1-3.2	1.1-3.7
	Pool spacing/bankfull width	*	0	3.0-5.0	3.0-5.0	1.7-2.7	3.1-5.2

Table 9. UT2 Stream Morphology Table

Variables		Existing UT2	UT2 Design Reference: Ecoregion 71 Regional Curve	Proposed UT2
Rosgen Stream Type		E6b	*	C
Drainage Area (mi^2)		0.06	0.06	0.06
Bankfull Width (W_{bkf}) (ft)		3.3	7.4	5.0
Bankfull Mean Depth (d_{bkf}) (ft)		0.4	0.5	0.3
Bankfull Cross Sectional Area (A_{bkf}) (ft^2)		1.4	3.8	1.6
Width/depth Ratio (W_{bkf}/d_{bkf})		7.7	14.4	12.5
Maximum Depth (d_{mbkf}) (ft)		0.6	*	0.4
Width of flood prone area (W_{fpa}) (ft)		39.8	*	≥ 25
Entrenchment Ratio (ER)		12.2	*	≥ 5.0
Sinuosity (stream length/valley length) (K)		1	*	1.2
Dimension	Pool Depth (ft)	0.2-0.8	*	1.0
	Riffle Depth (ft)	0.3-0.9	*	0.4
	Pool Width (ft)	*	*	7.0
	Riffle Width (ft)	3.3	*	5.0
	Pool XS Area (sf)	*	*	4.8
	Riffle XS Area (sf)	1.4	3.8	1.6
	Bank Height Ratio	1	*	1.0
	Mean Bankfull Velocity (V) (fps)	2.8	*	2.5
	Bankfull Discharge (Q) (cfs)	3.9	13	4.1
Pattern	Meander length (L_m) (ft)	*	23.0-74.2	41.8-49.5
	Radius of curvature (R_c) (ft)	*	11.1-31.2	8.0-22.0
	Belt width (W_{blt}) (ft)	*	12.6-25.2	9.0-21.4
	Meander width ratio (W_{blt}/W_{bkf})	*	1.7-3.4	1.8-4.3
	Radius of curvature/bankfull width	*	1.5-4.2	1.6-4.4
	Meander length/bankfull width	*	3.1-10.0	7.8-10.3
Profile	Average water surface slope	0.032	*	0.017
	Pool spacing	91.1	22.2-37.0	19.3-27.0
	Riffle slope/avg water surface slope	0.7-2.6	0.8-3.9	1.2-3.1
	Pool length/bankfull width	0.8-2.6	0.8-6.2	1.8-3.1
	Pool spacing/bankfull width	27.8	3.0-5.0	3.9-5.4

2.6.2.3. WORK APPROACH

The streams will be restored through the construction of a new dimension, pattern, and profile. Implementation of the design will follow typical construction sequencing for stream restoration projects. All construction will occur in dry portions of channel, with flow being pumped around the work area. Any water within the work areas will be pumped through a sediment filter bag to clean the water prior to releasing it downstream. If there are portions of channel that can be constructed in the dry and not tied to the existing channel, these sections will be constructed separately with the connections occurring at the very end. This approach is possible along the majority of UT1 Reach 1.

2.6.3. PLANTED VEGETATION

2.6.3.1. PLANTING LIST

A mix of native species were selected to be planted within the riparian zone that represent multiple strata and succession stages. A planting density of 968 stems/acre was selected for this project. Shrub species comprise 52% of the plantings while a combination of midstory and overstory trees represent the remaining 48%. See the Planting Plan sheets in **Appendix E** for the list of species to be planted within the riparian zones.

2.6.3.2. SOURCE

Bare-root trees and live stakes for this project will be purchased from a private nursery located in Tennessee or the Tennessee Department of Agriculture's Division of Forestry nursery. The specific source of these plants will be at the discretion of the contractor, but Metro Water may require the plants to be from a Tennessee source.

The herbaceous groundcover will be established by seeding of the easement area using the seed mix listed in the plans. This mix will be procured from a specialty seed company. The preference will be for the seed to be locally sourced from Tennessee, but this will be dependent on availability.

2.6.3.3. NATURAL REGENERATION

Natural regeneration is likely to be a source of vegetation establishment along UT1 and UT2 as mature trees and shrubs are currently present in the surrounding area. Any trees not removed in the construction project could provide reseeding opportunities. However, additional seeds will likely come to the project area from outside of the immediate project vicinity through natural dispersal methods. In addition to desirable species, non-native invasive species will also naturally regenerate within the project area. Over the course of monitoring, these species will be controlled through maintenance as discussed in the following section.

2.7 MAINTENANCE PLAN

This project is designed to be self-sustaining, but various maintenance activities could arise following construction and throughout the project's monitoring period. All maintenance activities performed during the monitoring period will be documented in the annual monitoring reports submitted by Metro Water or their agent. Maintenance will occur throughout the monitoring period to ensure that the project is progressing toward meeting the established performance standards.

2.7.1. RESPONSIBLE PARTY

Nashville Metro Water Services is the party responsible for all aspects of this site. They may choose to designate a consultant or contractor to evaluate the site, recommend maintenance, and/or conduct maintenance activities. If there is a warranty period, Metro Water may hold the original construction contractor responsible for warranty items.

2.7.2. MAINTENANCE ACTIVITIES

Maintenance activities at the site may include supplemental planting, seeding, invasive species treatment, structural repair to banks and/or instream structures or other measures determined appropriate by Metro Water. Any maintenance or alterations to the stream will be made according to the principles of natural channel design. All site maintenance will be documented in the annual monitoring reports submitted to USACE and TDEC. After the monitoring period has ended, the site will be allowed to mature naturally and Metro Water will cease maintenance activities.

2.8 PERFORMANCE STANDARDS

2.8.1. METRICS

The performance standards listed below are intended to aid in determining if the project can be expected to continue to provide all of the desired aquatic functions described within the project goals and objectives and be self-sustaining after the monitoring period. The performance standards for this project are based primarily on the Tennessee Stream Quantification Tool (SQT) methodology. Not all function-based parameters within the SQT will be assessed and **Table 10** summarizes the selected parameters specific to this restoration project. The SQT will document pre-restoration values, as-built values, and the annual monitored values for these parameters. If monitoring results indicate that functional parameters are outside of the proposed ranges established in the as-built documentation it should not immediately be interpreted as failing. Natural streams have a wide range of variability, while remaining functional systems. Many stream restoration projects undergo a settling period as they mature to become stable systems. If monitoring determines that some of the metrics fall outside of these ranges, these situations will be evaluated using the adaptive management process described in this mitigation plan. The SQT performance standards in the following table have been established to identify the need for adaptive management throughout the monitoring period.

Table 10. Hydraulic and Geomorphology Performance Standards

Hydraulic Parameters	UT1 and UT2 Field Values
Bank Height Ratio	≤ 1.2
Entrenchment Ratio	≥ 5.0
Geomorphology Parameters	
Dominant BEHI/NBS	≥ 0.7 Index Value
Percent Streambank Erosion	≤ 9%
Large Woody Debris Index	≥ 179
Pool Spacing Ratio	3.0-5.0
Pool Depth Ratio	≥ 2.0
Percent Riffle (%)	24-56%
Riparian Vegetation SQT Average Index Value	≥ 0.5 Index Value

ADDITIONAL PERFORMANCE STANDARDS

Ordinary High-Water Mark (OHWM): The Permittee shall ensure that all mitigation stream reaches receive sufficient flow throughout the monitoring period to maintain an OHWM in accordance with the requirements of RGL 05-05, dated December 7, 2005, which establishes the extent of USACE jurisdiction for non-tidal waters for CWA Section 404.

Flow Regime: The Permittee shall ensure that adequate channel lining is designed and constructed to minimize loss of hydrology in channels. The flow regime (e.g., intermittent, perennial) of all mitigation stream reaches shall remain the same or increase in hydrologic condition relative to the original stream(s).

Riparian Plantings: The Permittee shall ensure a minimum of 240 stems per acre throughout the monitoring period, within all areas of new riparian plantings. No more than 30% of any one species of the native riparian plant community shall count towards stems per acre. It is acknowledged that desirable, native volunteer species may comprise more than 30% of the actual stem count, but stems in excess of the 30% limit cannot be counted towards the target values for applicable performance standards. Vegetation counted towards survival rates, including both planted and volunteer, shall be of desirable species typically found in riparian plant communities and native to the ecoregion. The compensatory mitigation project shall be designed and sited to ensure a self-sustaining native plant community, once performance standards have been achieved. If the project site is dominated by mature trees, the tree density requirement may be reduced, at USACE discretion.

Invasive Species: The resultant mitigation plant communities shall contain no more than 5% areal coverage of species identified on the Tennessee Invasive Plant Council's (TN-IPC) "Invasive Plant List" and "Additional Invasive Plants to Avoid" list (www.tnipc.org.) throughout the monitoring period. No contiguous areas greater than 200 square feet shall be vegetated with more than 50% relative areal coverage of invasive species at the end of the monitoring period. Implementation of invasive species control measures should be conducted in accordance with the Adaptive Management Plan and may be required on a case-by-case basis as determined by USACE.

Bankfull Events: A bankfull event must be measured and documented along with the associated precipitation event in a minimum of two years of the monitoring period. Particular attention will be made to document the out of bank events to illustrate the connection of the stream to the floodplain and adjacent wetlands along UT1.

FORMAT

The values of the performance standards will be collected during each monitoring year. These data will be collected and be reported as part of the project's yearly monitoring process. Each monitoring report will document these values in tabular format to include the designed, as built, and the yearly monitoring data for comparison over time.

2.8.2. FUNCTIONAL ASSESSMENT

The stream will be assessed following the protocols described in the Rapid Data Collection Methods manual. The above performance standards, along with visual assessments and a descriptive narrative, will document how the stream is attaining the functions described in the project objectives.

2.9 MONITORING REQUIREMENTS

2.9.1. MONITORING PLAN

The site will be assessed at the as-built stage after construction and then monitored for five years. The as-built documentation will include the items described below and a list of the quantity, stock type, and species of vegetation planted. For hydraulic functional parameters, two riffle cross-sections will be established on each reach of the project streams to evaluate channel dimensions. These features will be permanently marked in the field and span the channel and the bankfull bench on each side of the channel. One longitudinal profile (at least two meander lengths) will be established on each reach of project streams to evaluate vertical stability, planform and bedform diversity. Two vegetation plots (one left bank and one right bank plot) will be established on each of the project reaches for a total of six permanent vegetation plots. These plots will each have an area of $100m^2$, and the plot corners will be permanently marked in the field. Additional functional parameters including large woody debris, percent stream bank erosion, and BEHI/NBS will be assessed beginning in Monitoring Year 1 and will continue following the monitoring schedule identified in **Table 11**. Three permanent photo points will be established for each reach of the project streams. The locations of all monitoring features will be documented in the as-built submission.

In addition to the specific monitoring features described above, there will be a yearly visual assessment of the site. A narrative will be developed from this qualitative assessment and included in the monitoring report that will document changes at the site, maintenance items, site deficiencies, and how the site is developing in respect to the specific objectives for this project.

Table 11. Monitoring Plan

Component	Data collection	As-Built	Year 1	Year 2	Year 3	Year 4	Year 5
Hydraulics	Cross Sections (BHR and Entrenchment Ratio)	X	X	X	X	X	X
Geomorphology	Longitudinal Profiles (Bedform Diversity)	X	X	X	X	X	X
	Lateral Migration (Dominant BEHI/NBS and Percent Streambank Erosion)		X	X	X	X	X
	Large Woody Debris		X	X	X	X	X
	Riparian Vegetation Plots		X	X	X	X	X
Biology and Physicochemical	Benthic Macroinvertebrate Sampling (TMI)				X		X
Qualitative Visual Assessment	Visual inspection of the site	X	X	X	X	X	X
	Site Photos	X	X	X	X	X	X

2.9.2. RESPONSIBLE PARTY

Metro Water is the responsible party for submitting annual monitoring reports for this stream project. They may use a qualified consultant to conduct the monitoring and develop the annual monitoring report.

2.9.3. REPORTING

Monitoring reports will be submitted to USACE and TDEC on or before October 31st of each of the five monitoring years. The first year of monitoring will be the year of the first growing season after planting, with the vegetation plots being evaluated at least five months after initial planting.

2.9.4. REPORTING FORMAT

The monitoring reports will include the following components:

- Introduction describing the project history
- Narrative of the site visual assessment
- Site photos
- A Monitoring Plan View map of the site
- SQT workbook and supporting data
- Tables comparing pre-restoration, design, post-restoration baseline, and monitoring data between monitoring years as it relates to the functional assessment
- Concluding narrative summarizing how the site is meeting or not meeting the performance standards, justification if they are not being met, and progression of the site towards meeting project objectives

2.10 LONG-TERM MANAGEMENT PLAN

2.10.1. LONG-TERM MANAGEMENT

After the monitoring period has concluded and all performance standards have been met, the site will remain protected as outlined in the executed Land Use Restriction Agreement and the long-term management phase will begin. The Cumberland River Compact will oversee the mitigation site and ensure that easement integrity is maintained, and the property owners are observing the established land use restrictions. At the end of the monitoring and adaptive management period, Cumberland River Compact is required to manage, monitor, and maintain the mitigation site in perpetuity in accordance with the Compensatory Mitigation Plan, Land Use Restriction Agreement, and the Long-Term Management Plan. Long-term management activities shall include: Maintenance of Signage, Land Use Restriction Enforcement, Woody Invasive Plant Removal (see target species in Table 12), and Reporting. Woody invasive plant removal will either be conducted by the long-term manager or an agent of Metro Water Services. In regard to long-term management funding, Metro Water Services will make a one-time lump sum payment for the amount that has been requested by the Cumberland River Compact to fulfill the obligations as described within this Long-Term Management Plan and the Land Use Restriction Agreement. Metro Water Services will provide proof of payment prior to the end of the monitoring and adaptive management phase.

During the long-term management phase, Cumberland River Compact shall be responsible for submitting biennial (every two years) reports to TDEC and USACE.

Long-term management activities will be conducted to ensure the mitigation site remains perpetually monitored. The long-term manager will be responsible for inspecting the protected area annually and for conducting the long-term management activities as described below, as necessary to rectify identified deficiencies. The restrictions and long-term management responsibilities will convey with the land, should the property be transferred in the future. The long-term manager will be responsible for periodic inspection of the site to ensure that the restrictions documented in the recorded deed restrictions are upheld.

Table 12. Long-Term Management Activities

Long-Term Management Activity	Long-Term Manager Responsibility	Landowner Responsibility
Signage will be installed by Metro Water Services or their agent and maintained by the long-term manager along the mitigation site boundary to denote the area protected by the recorded Land Use Restriction Agreement.	The long-term manager will be responsible for inspecting the mitigation site boundary and for maintaining or replacing signage to ensure that the protected area is clearly marked.	The landowner(s) shall report damaged or missing signs to the long-term manager, as well as contact the long-term manager if a boundary needs to be marked, or clarification is needed regarding a boundary location.
The mitigation site will be protected in its entirety and managed under the terms outlined in the Land Use Restriction Agreement.	The long-term manager will be responsible for conducting annual inspections and for undertaking actions that are reasonably calculated to swiftly correct the conditions constituting a breach.	The landowner(s) shall contact the long-term manager if clarification is needed regarding the restrictions associated with the recorded Land Use Restriction Agreement.
The following woody invasive plants will be treated to allow natural regeneration of native species within the protected area boundary: Chinese privet (*Ligustrum sinense*), bush honeysuckle (*Lonicera maackii*), and multiflora rose (*Rosa multiflora*)	The long-term manager or an agent of Metro Water Services will be responsible for chemically and/or mechanically removing woody invasive plants to ensure the plant community is predominantly comprised of native vegetation. MWS shall report any invasive plant management activities to the long-term manager if a separate agent is used for invasive management.	The landowner(s) shall contact the long-term manager regarding any concerns regarding the presence of woody invasive plant communities.

2.10.2. RESPONSIBLE PARTY

Cumberland River Compact is the assigned Long-Term Steward for the mitigation site.

Contact Information:
Mekayle Houghton – Executive Director
35 Peabody Street, #305, Nashville TN 37210
615-210-9600
mekayle.houghton@cumberlandrivercompact.org

2.11 ADAPTIVE MANAGEMENT PLAN

Since there are many factors that influence the success of a natural channel design project, it is beneficial to have an adaptive management plan in place if unexpected issues do occur. The point of this plan is to acknowledge that the unexpected may happen and that there are multiple ways to deal with these issues that will still result in a successful mitigation project. Any adaptive management matters will be described in the yearly monitoring report or brought to the attention of the regulatory community directly from Metro Water.

Upon completion of site construction, Metro Water will implement the post-construction monitoring protocols previously defined in this mitigation plan. If, during the course of annual monitoring it is determined the site's ability to achieve site performance standards are jeopardized, the project owner or their agent will document the performance deficiencies and notify USACE and TDEC, who then may determine a Corrective Action Plan is needed. Isolated actions including limited bank grading, single structure repair, routine invasive species control, repairing bank matting, or other minor maintenance actions will not require a Corrective Action Plan. All maintenance actions will be documented in the yearly monitoring report.

2.11.1. RESPONSIBLE PARTY

Metro Water is the responsible party and will report all Adaptive Management concerns or activities to USACE and TDEC. They may utilize a qualified consultant to implement adaptive management measures at the site.

2.11.2. POTENTIAL PROBLEMS

As mentioned in previous sections, there are many factors that could contribute to potential problems on a natural channel design project. Some of these problems could be related to vegetation establishment, invasive species, in-channel erosion, instability of in-channel structures, drought or floods, or impacts to the stream from upstream sources. These, and other yet unidentified problems, could negatively affect the site.

2.11.3. CORRECTIVE MEASURES

Corrective measures will occur throughout the monitoring period to ensure that the project is progressing as expected. Potential corrective activities are discussed below. The project streams are designed to be self-sustaining and not require long term maintenance. However, during the monitoring period while the site is becoming established, deficiencies may be noted and require maintenance or larger scale adaptive management. Corrective measures at the site may include supplemental planting, seeding, invasive species treatment, structural repair to banks or in-stream structures or other measures determined appropriate Metro Water or their agent. Any maintenance, corrective actions, or alterations to the stream will be made according to the principles of natural channel design. All site activities will be documented in the yearly monitoring reports submitted to USACE and TDEC. After the monitoring period has ended the site will be allowed to mature naturally and maintenance activities will cease.

The corrective measures that are taken will be comparable in scale to the problem encountered. Additionally, corrective measures could be made to prevent future problems if any are anticipated during the monitoring period.

Table 13. Potential Adaptive Management/Maintenance Actions

Component	Potential Actions Through Project Close-Out
Stream Stability	- Securing of loose coir matting - Supplemental installation of live stakes - Grading of steep eroding banks - Installation of grade control structures - Large scale grading of channel planform where systematic problems have occurred
Vegetation	- Invasive species control through herbicide application or other methods (manual or mechanical) - Supplemental planting of low vigor portions of the easement - Complete replanting of the easement - Ripping areas of compacted soils in the easement and adding soil amendments
Hydrology	- Investigate source of hydrology problem - Reduce credit based on consultation with USACE/TDEC
Site Boundary	- Improve/repair boundary marking

2.11.4. TIMING

The timing of the adaptive management process is dependent on the issue that needs to be addressed. Many problems should be managed immediately so that they do not become worse or negatively affect a larger part of the project. However, as in many natural systems, there are many problems that will resolve themselves over time. In these instances, corrective measures may be delayed or not implemented at all if the situation remedies itself. Any issues encountered and documented within the monitoring report will also include a discussion of potential remedies and the timing associated with moving forward on those issues.

2.12 FINANCIAL ASSURANCES

2.12.1. FINANCIAL ASSURANCE

As the responsible party for all aspects of this project, Metro Water is also responsible for the financial assurances associated with this project. Metro Water understands the financial commitment to implement a successful mitigation project including the design, construction, monitoring, maintenance, and adaptive management of these projects. Metro Water has sufficient funds to implement this mitigation plan and fulfill all of the obligations described within this plan. For this reason, a performance bond, letter of credit, or other record of financial assurance will not be necessary for this project. A preliminary construction cost estimate is included in **Appendix G**. As a government entity of a large metropolitan area, Metro Water has the means to cover all estimated project costs.

2.12.2. REVIEW

See discussion above, not applicable.

2.13 OTHER INFORMATION

2.13.1. ACCESS TO PROPERTY

The project is located in a public park which is easily accessible. Accessing the portion of the project within the golf course should be coordinated with Shelby Golf Course staff.

2.13.2. CONTACT INFORMATION

Shelby Golf Course
2021 Fatherland St. Nashville, TN 37206
615-862-8474

3.0 ENVIRONMENTALLY PREFEREABLE CONSIDERATIONS

3.1 UNCERTAINTY AND RISK

As currently proposed, the restoration of UT1 and UT2 exceeds the credit need by approximately 91 credits. The majority of credit generation for this project comes from physical, designed changes to the streams' dimension and pattern that are not likely to change significantly over time. The drainage area is also relatively small and the proposed stream slopes are low-gradient reducing erosion risk. Additionally, the execution of the site protection instrument provides long-term protection to the resources once they achieve the established performance standards. This mitigation plan outlines the processes by which this mitigation will be implemented and demonstrates that due diligence has been applied throughout its design and planning, which has been conducted by qualified consultants.

The reasons outlined above demonstrate that there is minimal uncertainty and risk associated with this mitigation project. Any uncertainty and risk associated with project success is mitigated by the maintenance and adaptive management plans described in this mitigation plan.

3.2 SIZE AND ECOLOGICAL VALUE OF PARCEL

The selected mitigation site provides the unique opportunity to offset unavoidable impacts by improving ecological stream function within the same HUC12 watershed as the impacts. The impact site is located just one mile from the restoration site. The proposed project size and identified site constraints allow for significant lift along both project streams. The stream will have a protected riparian buffer within a heavily urbanized watershed. The total average riparian buffer width will be greater than 50 feet throughout the majority of the project. A protected riparian corridor in combination with having natural stream processes restored will provide significant ecological value within the watershed. Functional lift associated with the project is described in the Existing and Proposed Stream Quantification Tool Data Forms in **Appendix B**.

3.3 TEMPORAL LOSS

The implementation of the UT1 and UT2 restoration will result in minimal temporal loss of resources because the impacts will occur within the same construction schedule as the restoration of UT1 and UT2 and impacts associated with Stream 1. Even though some temporal loss of function could be considered based on the time it may take for the functions of the new reach to achieve the same level

as the original channel and eventually the proposed condition, there is no reason to believe that this will be a significant temporal loss. The development of these functions will be documented in the yearly monitoring reports.

3.4 SCIENTIFIC/TECHNICAL ANALYSIS, PLANNING, AND IMPLEMENTATION

The level of detail executed for the assessment and design of this mitigation project is of the same scale and scope as other stream restoration projects associated with in-lieu fee programs or mitigation banks. There is a strong likelihood for success of this project based on its close location to the impacts and the comprehensive assessment, design, and regulatory review processes that have been outlined within this mitigation plan.

3.5 LONG-TERM VIABILITY OF MITIGATION

The mitigation has been designed in an ecologically appropriate and self-sustaining manner. The monitoring reports will demonstrate that the site is achieving the performance standards and is on the path to long-term stability and success.

3.6 SITE PROTECTION

As discussed previously in the mitigation plan, the project stream will be protected through the execution of a Land Use Restriction Agreement. This real estate agreement will provide long-term protection of the natural resources in perpetuity. There will be adequate signage that demarcates the limits of the protected riparian buffer.

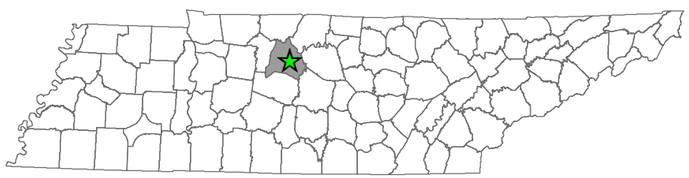
3.7 FINANCIAL ASSURANCES

See previous discussion of Financial Assurances in **Section 2.12**.

Appendix A

Maps

Lat 36.172803 / Long -86.73119



Project Location:
Davidson Coutny, TN

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

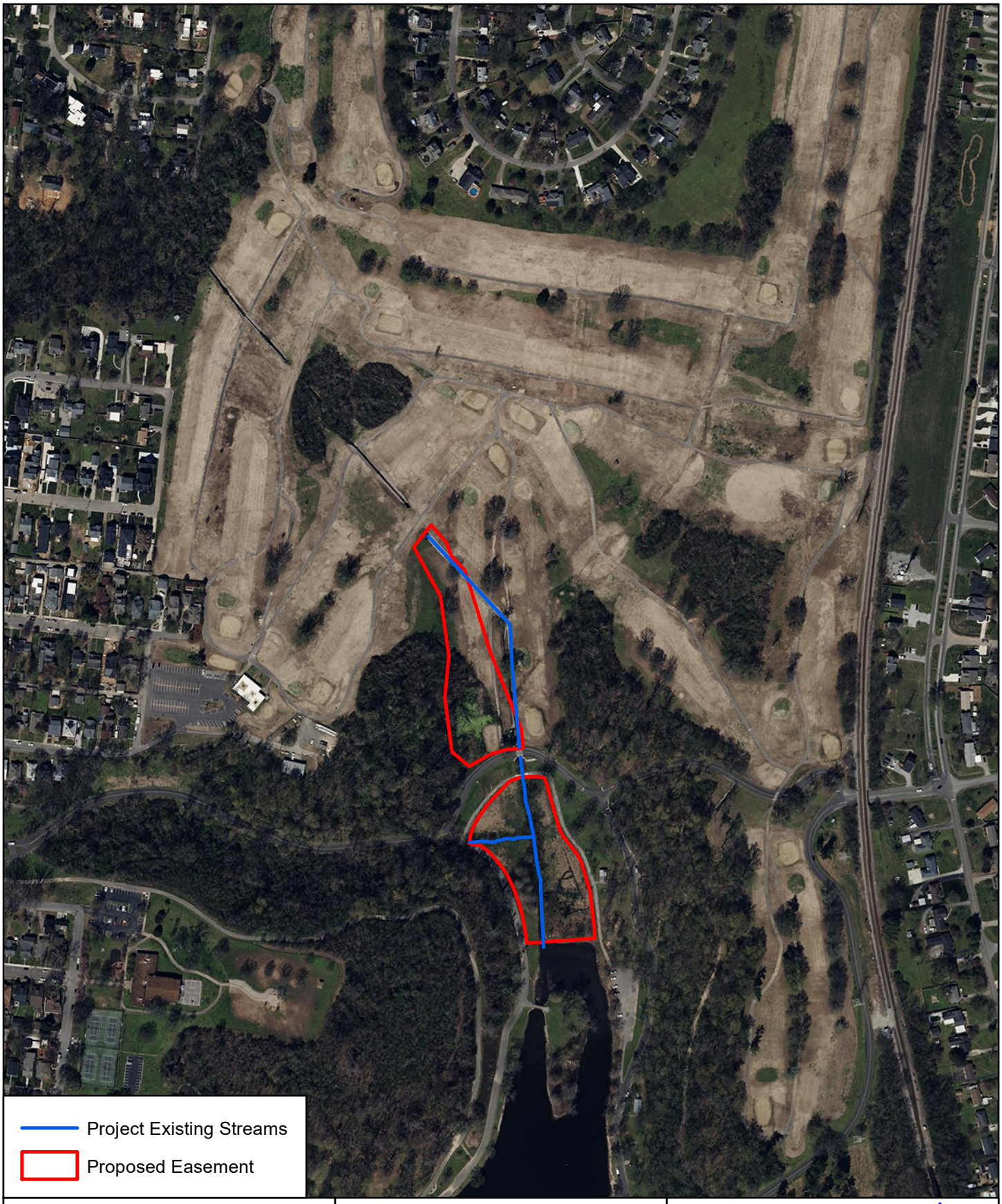
KCI TECHNOLOGIES

FIGURE 1. VICINITY MAP
LOCKELAND SPRINGS RESTORATION SITE
DAVIDSON COUNTY,TN

N

Project Location

0 1,500 3,000
Feet



0 300 600 Feet

Aerial Source: Vexcel Imagery 2023

FIGURE 2. AERIAL MAP
LOCKELAND SPRINGS
RESTORATION SITE
DAVIDSON COUNTY, TN

N

KCI TECHNOLOGIES

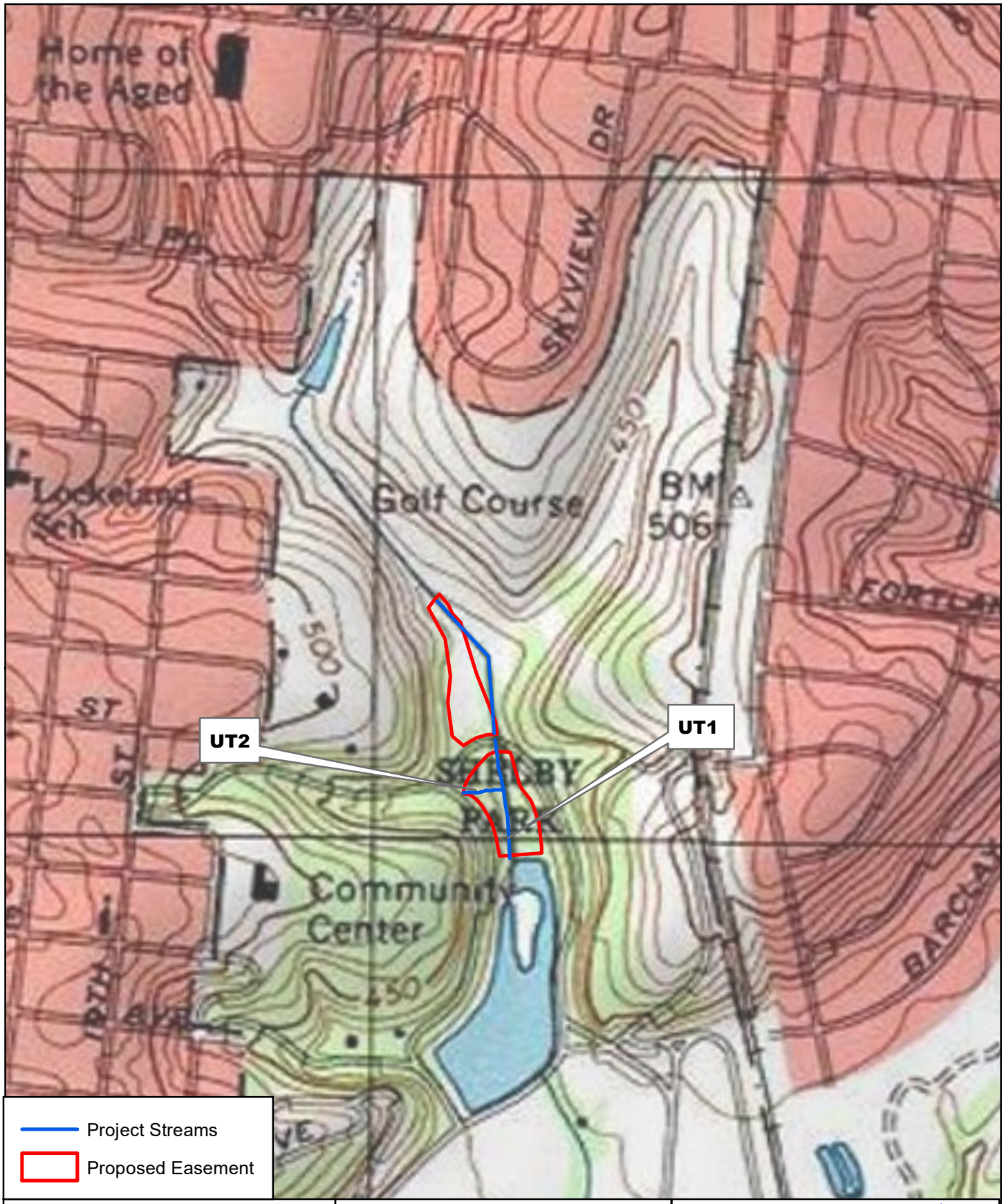
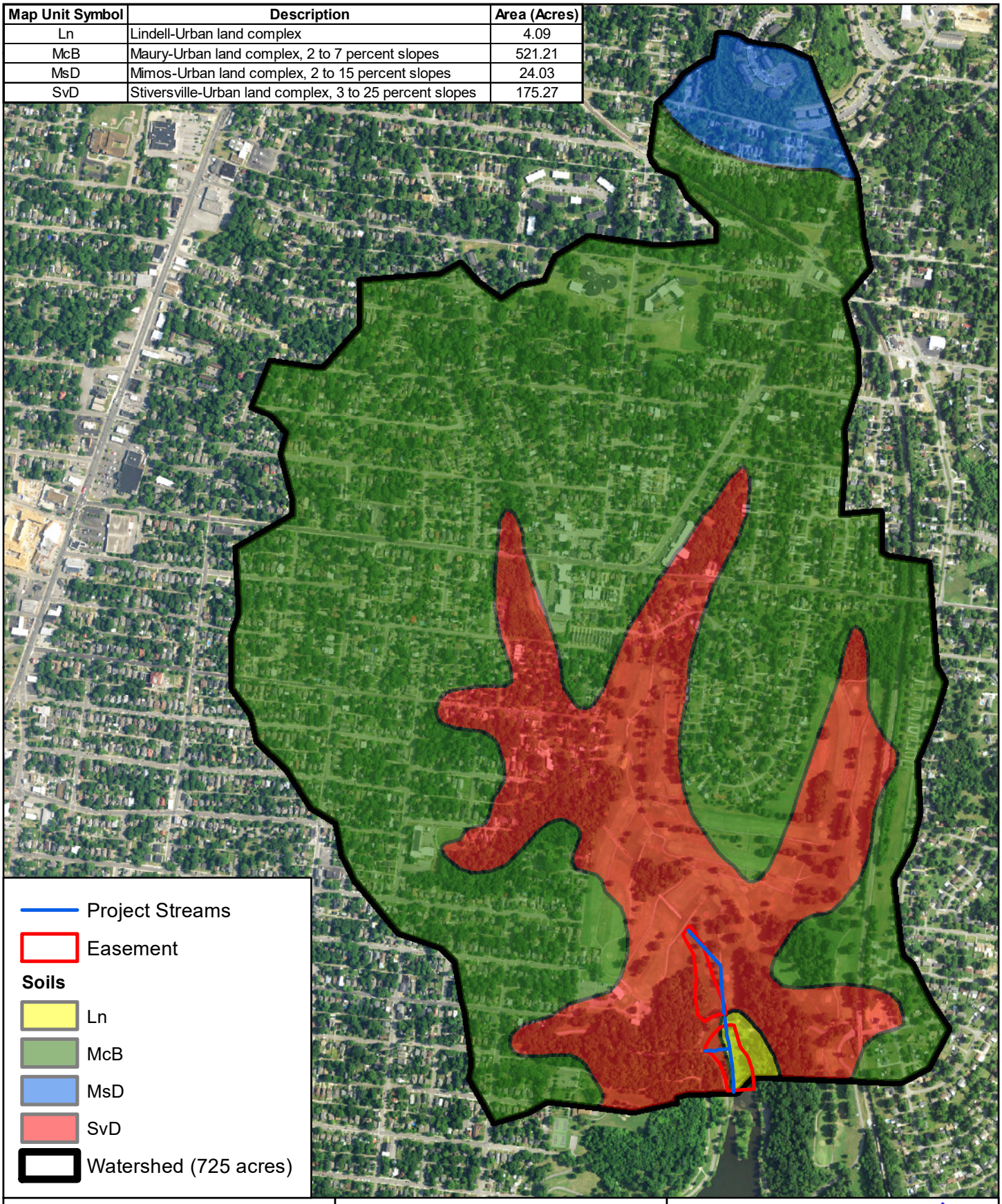


FIGURE 3. USGS TOPOGRAPHIC MAP
LOCKELAND SPRINGS
RESTORATION SITE
DAVIDSON COUNTY, TN

FIGURE 4. PARCEL MAP
LOCKELAND SPRINGS RESTORATION SITE
DAVIDSON COUNTY, TN

FIGURE 5. AQUATIC RESOURCE
LOCKELAND SPRINGS RESTORATION SITE
DAVIDSON COUNTY, TN

Map Unit Symbol	Description	Area (Acres)
Ln	Lindell-Urban land complex	4.09
McB	Maury-Urban land complex, 2 to 7 percent slopes	521.21
MsD	Mimos-Urban land complex, 2 to 15 percent slopes	24.03
SvD	Stiversville-Urban land complex, 3 to 25 percent slopes	175.27



0 900 1,800 Feet

Aerial Source: NAIP 2016

FIGURE 6. SOIL MAP
LOCKELAND SPRINGS
RESTORATION SITE
DAVIDSON COUNTY, TN

N

KCI TECHNOLOGIES

0 500 1,000 Feet

Proposed Easement

FIGURE 7. HISTORICAL IMAGERY
LOCKELAND SPRINGS
RESTORATION SITE
DAVIDSON COUNTY, TN

N

KCI TECHNOLOGIES

0 150 300 Feet

Aerial Source: Vexcel Imagery 2023

FIGURE 8. PHOTO REFERENCE MAP
LOCKELAND SPRINGS
RESTORATION SITE
DAVIDSON COUNTY, TN

N

KCI TECHNOLOGIES

Appendix B

Stream Quantification Tool Workbooks

Project Name:	**Lockeland Springs Stream Restoration**
Stream Name:	**UT1 and UT2**
Programmatic Goals:	**Permittee Responsible Mitigation**

Explain the goals and objectives for this stream project:

Goals: Offset unavoidable impacts associated with the expansion of a water treatment facility by restoring two tributaries within Shelby Park.

Objectives: Restore stream function by replacing straightened stream channels with a meandering stream with riffle-pool sequencing.

Explain the restoration potential of this stream based on the programmatic goals:	Describe this stream AND reach break criteria:

Project Name:	**Lockeland Springs Stream Restoration**
Stream Name:	**UT1 and UT2**

Stream Summary Information					
Reach ID	**Existing Stream Length (feet)**	**Proposed Stream Length (feet)**	**Change in Functional Condition (PCS - ECS)**		**Functional Lift (Credits)**
UT1 Reach 1	762.2	701.7	0.49		340.8
UT1 Reach 2	515.4	550.0	0.30		174.7
UT2	208.2	228.3	0.13		40.7
0	0.0	0.0			
0	0.0	0.0			
Totals	1485.8	1480.0	0.92		556.2

Stream Evolution Description

Describe the stage of channel evolution for each reach using either the Stream Evolution Model (Cleur and Thorne, 2013) and/or the Rosgen Channel Succession Scenario (Rosgen, 2006).

Describe the stage of channel evolution for: REACH 1	Describe the stage of channel evolution for: REACH 2	Describe the stage of channel evolution for: REACH 5
Describe the stage of channel evolution for: REACH 3	Describe the stage of channel evolution for: REACH 4	

Insert Aerial Photo of Project Reach

The Tennessee Stream Quantification Tool Credits:

Lead Agency: Tennessee Department of Environment and Conservation (TDEC)

Contributing Agencies: U.S. Environmental Protection Agency
U.S. Army Corps of Engineers
Tennessee Interagency Review Team

Contractors:

Stream Mechanics
Ecosystem Planning and Restoration (EPR)

Version 1.3
Version Last Updated 6/9/2023

NOTICE: If you find errors or problems, please contact Vena L. Jones at vena.l.jones@tn.gov

TN SQT v1.3
Quantification Tool Spreadsheet Reach 1

Reach Information and Reference Standard Stratification	
Project Name:	Lockeland Springs
Reach ID:	UT1 Reach 1
Upstream Latitude:	36.174686
Upstream Longitude:	-86.732116
Downstream Latitude:	36.172779
Downstream Longitude:	-86.731124
Existing Stream Type:	F
Proposed Stream Type:	C
Ecoregion:	71h
Drainage Area (sqmi):	1
Proposed Bed Material:	Gravel
Existing Stream Length (feet):	762.2
Proposed Stream Length (feet):	701.7
Proposed Stream Slope (%):	1
Proposed Flow Type:	Perennial/Intermittent
Data Collection Season:	January - June
Macro Collection Method:	SQKICK
Valley Type:	Unconfined Alluvial

Notes
1. Users input values that are highlighted based on restoration potential
2. Users select values from a pull-down menu
3. Leave values blank for field values that were not measured
4. These field values do not apply to ephemeral channels.

FUNCTIONAL LIFT SUMMARY	
Exisiting Condition Score (ECS)	0.05
Proposed Condition Score (PCS)	0.54
Change in Functional Condition (PCS - ECS)	0.49
Existing Stream Length (feet)	762.2
Proposed Stream Length (feet)	701.7
Additional Stream Length (feet)	-60.5
Existing Stream Functional Feet (FF)	38
Proposed Stream Functional Feet (FF)	379
Functional Lift (Proposed FF - Existing FF)	341

MITIGATION SUMMARY	
341	**Credits**

FUNCTION BASED PARAMETERS SUMMARY			
Functional Category	**Function-Based Parameters**	**Existing Parameter**	**Proposed Parameter**
Hydrology	Catchment Hydrology	0.27	0.27
	Reach Runoff	0.24	0.26
Hydraulics	Floodplain Connectivity	0.00	1.00
Geomorphology	Large Woody Debris	0.00	0.83
	Lateral Migration	0.00	1.00
	Riparian Vegetation	0.00	0.33
	Bed Material		
	Bed Form Diversity	0.00	1.00
	Sinuosity	0.00	0.00
Physicochemical	Bacteria		
	Organic Enrichment	0.00	0.48
	Nitrogen		
	Phosphorus		
Biology	Macroinvertebrates	0.00	0.28
	Fish		

FUNCTIONAL CATEGORY REPORT CARD			
Functional Category	**ECS**	**PCS**	**Functional Lift**
Hydrology	0.26	0.27	0.01
Hydraulics	0.00	1.00	1.00
Geomorphology	0.00	0.63	0.63
Physicochemical	0.00	0.48	0.48
Biology	0.00	0.28	0.28

TN SQT v1.3
Quantification Tool Spreadsheet Reach 1

EXISTING CONDITION ASSESSMENT					Roll Up Scoring				
Functional Category	**Function-Based Parameters**	**Measurement Method**	**Field Value**	**Index Value**	**Parameter**	**Category**	**Category**	**ECS**	**ECS**
Hydrology	Catchment Hydrology	Watershed Land Use Runoff Score	0.26	0.27	0.27	0.26	Not Functioning	0.05	Not Functioning
	Reach Runoff	Stormwater Infiltration	0.24	0.24	0.24				
Hydraulics	Floodplain Connectivity	Bank Height Ratio	10	0.00	0.00	0.00	Not Functioning		
		Entrenchment Ratio	1	0.00					
Geomorphology	Large Woody Debris	Large Woody Debris Index	0	0.00	0.00	0.00	Not Functioning		
		# Pieces							
	Lateral Migration	Erosion Rate (ft/yr)			0.00				
		Dominant BEHI/NBS	Ex/Ex	0.00					
		Percent Streambank Erosion (%)	100	0.00					
		Percent Armoring (%)	100	0.00					
	Riparian Vegetation	Left - Average Diameter at Breast Height (DBH; in)	0	0.00	0.00				
		Right - Average DBH (in)	0	0.00					
		Left - Buffer Width (feet)	0	0.00					
		Right - Buffer Width (feet)	0	0.00					
		Left - Tree Density (#/acre)	0	0.00					
		Right - Tree Density (#/acre)	0	0.00					
		Left - Native Herbaceous Cover (%)	0	0.00					
		Right - Native Herbaceous Cover (%)	0	0.00					
		Left - Native Shrub Cover (%)	0	0.00					
		Right - Native Shrub Cover (%)	0	0.00					
	Bed Material Characterization	Size Class Pebble Count Analyzer (p-value)							
	Bed Form Diversity	Pool Spacing Ratio	10	0.00	0.00				
		Pool Depth Ratio	1	0.00					
		Percent Riffle (%)	100	0.00					
		Aggradation Ratio							
	Plan Form	Sinuosity	1	0.00	0.00				
Physicochemical	Bacteria	E. Coli (Cfu/100 mL)				0.00	Not Functioning		
	Organic Enrichment	Percent Nutrient Tolerant Macroinvertebrates (%)	100	0.00	0.00				
	Nitrogen	Nitrate-Nitrite (mg/L)							
	Phosphorus	Total Phosphorus (mg/L)							
Biology	Macroinvertebrates	Tennessee Macroinvertebrate Index	0	0.00	0.00	0.00	Not Functioning		
		Percent Clingers (%)							
		Percent EPT - Cheumatopsyche (%)							
		Percent Oligochaeta and Chironomidae (%)							
	Fish	Native Fish Score Index							
		Catch per Unit Effort Score							

TN SQT v1.3
Quantification Tool Spreadsheet Reach 1

PROPOSED CONDITION ASSESSMENT					Roll Up Scoring				
Functional Category	**Function-Based Parameters**	**Measurement Method**	**Field Value**	**Index Value**	**Parameter**	**Category**	**Category**	**PCS**	**PCS**
Hydrology	Catchment Hydrology	Watershed Land Use Runoff Score	0.26	0.27	0.27	0.27	Not Functioning	0.54	Functioning At Risk
	Reach Runoff	Stormwater Infiltration	0.26	0.26	0.26				
Hydraulics	Floodplain Connectivity	Bank Height Ratio	1	1.00	1.00	1.00	Functioning		
		Entrenchment Ratio	5	1.00					
Geomorphology	Large Woody Debris	Large Woody Debris Index	250	0.83	0.83	0.63	Functioning At Risk		
		# Pieces							
	Lateral Migration	Erosion Rate (ft/yr)			1.00				
		Dominant BEHI/NBS	L/L	1.00					
		Percent Streambank Erosion (%)	5	1.00					
		Percent Armoring (%)	0	1.00					
	Riparian Vegetation	Left - Average Diameter at Breast Height (DBH; in)	0	0.00	0.33				
		Right - Average DBH (in)	1	0.11					
		Left - Buffer Width (feet)	0	0.00					
		Right - Buffer Width (feet)	103	0.81					
		Left - Tree Density (#/acre)	0	0.00					
		Right - Tree Density (#/acre)	300	0.82					
		Left - Native Herbaceous Cover (%)	0	0.00					
		Right - Native Herbaceous Cover (%)	80	1.00					
		Left - Native Shrub Cover (%)	0	0.00					
		Right - Native Shrub Cover (%)	25	0.54					
	Bed Material Characterization	Size Class Pebble Count Analyzer (p-value)							
	Bed Form Diversity	Pool Spacing Ratio	5	1.00	1.00				
		Pool Depth Ratio	2.5	1.00					
		Percent Riffle (%)	50	1.00					
		Aggradation Ratio							
	Plan Form	Sinuosity	1	0.00	0.00				
Physicochemical	Bacteria	E. Coli (Cfu/100 mL)				0.48	Functioning At Risk		
	Organic Enrichment	Percent Nutrient Tolerant Macroinvertebrates (%)	55.1	0.48	0.48				
	Nitrogen	Nitrate-Nitrite (mg/L)							
	Phosphorus	Total Phosphorus (mg/L)							
Biology	Macroinvertebrates	Tennessee Macroinvertebrate Index	18	0.28	0.28	0.28	Not Functioning		
		Percent Clingers (%)							
		Percent EPT - Cheumatopsyche (%)							
		Percent Oligochaeta and Chironomidae (%)							
	Fish	Native Fish Score Index							
		Catch per Unit Effort Score							

TN SQT v1.3
Quantification Tool Spreadsheet Reach 2

1. Users input values that are highlighted based on restoration potential
2. Users select values from a pull-down menu
3. Leave values blank for field values that were not measured
4. These field values do not apply to ephemeral channels.

Reference Standard Stratification

Project Name:	Lockeland Springs
Reach ID:	UT1 Reach 2
Upstream Latitude:	36.172779
Upstream Longitude:	-86.731124
Downstream Latitude:	36.171205
Downstream Longitude:	-86.73087
Existing Stream Type:	Gc
Proposed Stream Type:	C
Ecoregion:	71h
Drainage Area (sqmi):	1
Proposed Bed Material:	Gravel
Existing Stream Length (feet):	515.4
Proposed Stream Length (feet):	550
Proposed Stream Slope (%):	1
Proposed Flow Type:	Perennial/Intermittent
Data Collection Season:	January - June
Macro Collection Method:	SQKICK
Valley Type:	Unconfined Alluvial

FUNCTIONAL LIFT SUMMARY

Exisiting Condition Score (ECS)	0.28
Proposed Condition Score (PCS)	0.58
Change in Functional Condition (PCS - ECS)	0.30
Existing Stream Length (feet)	515.4
Proposed Stream Length (feet)	550
Additional Stream Length (feet)	34.6
Existing Stream Functional Feet (FF)	144
Proposed Stream Functional Feet (FF)	319
Functional Lift (Proposed FF - Existing FF)	175

MITIGATION SUMMARY

175 Credits

FUNCTION BASED PARAMETERS SUMMARY

Functional Category	Function-Based Parameters	Existing Parameter	Proposed Parameter
Hydrology	Catchment Hydrology	0.29	0.30
	Reach Runoff	0.45	0.48
Hydraulics	Floodplain Connectivity	0.00	1.00
Geomorphology	Large Woody Debris	0.00	0.81
	Lateral Migration	0.32	1.00
	Riparian Vegetation	0.36	0.66
	Bed Material		
	Bed Form Diversity	0.47	1.00
	Sinuosity	0.00	0.00
Physicochemical	Bacteria		
	Organic Enrichment	0.48	0.48
	Nitrogen		
	Phosphorus		
Biology	Macroinvertebrates	0.28	0.28
	Fish		

FUNCTIONAL CATEGORY REPORT CARD

Functional Category	ECS	PCS	Functional Lift
Hydrology	0.37	0.39	0.02
Hydraulics	0.00	1.00	1.00
Geomorphology	0.23	0.69	0.46
Physicochemical	0.48	0.48	0.00
Biology	0.28	0.28	0.00

TN SQT v1.3
Quantification Tool Spreadsheet Reach 2

EXISTING CONDITION ASSESSMENT					Roll Up Scoring				
Functional Category	**Function-Based Parameters**	**Measurement Method**	**Field Value**	**Index Value**	**Parameter**	**Category**	**Category**	**ECS**	**ECS**
Hydrology	Catchment Hydrology	Watershed Land Use Runoff Score	0.279	0.29	0.29	0.37	Functioning At Risk		
	Reach Runoff	Stormwater Infiltration	0.45	0.45	0.45				
Hydraulics	Floodplain Connectivity	Bank Height Ratio	2.6	0.00	0.00	0.00	Not Functioning		
		Entrenchment Ratio	1.8	0.00					
Geomorphology	Large Woody Debris	Large Woody Debris Index	0	0.00	0.00	0.23	Not Functioning	0.28	Not Functioning
		# Pieces							
	Lateral Migration	Erosion Rate (ft/yr)			0.32				
		Dominant BEHI/NBS	M/H	0.30					
		Percent Streambank Erosion (%)	20	0.34					
		Percent Armoring (%)							
	Riparian Vegetation	Left - Average Diameter at Breast Height (DBH; in)	0	0.00	0.36				
		Right - Average DBH (in)	0	0.00					
		Left - Buffer Width (feet)	91	0.78					
		Right - Buffer Width (feet)	89	0.78					
		Left - Tree Density (#/acre)	0	0.00					
		Right - Tree Density (#/acre)	0	0.00					
		Left - Native Herbaceous Cover (%)	80	1.00					
		Right - Native Herbaceous Cover (%)	80	1.00					
		Left - Native Shrub Cover (%)	0	0.00					
		Right - Native Shrub Cover (%)	0	0.00					
	Bed Material Characterization	Size Class Pebble Count Analyzer (p-value)							
	Bed Form Diversity	Pool Spacing Ratio	9.8	0.00	0.47				
		Pool Depth Ratio	2	0.70					
		Percent Riffle (%)	24	0.70					
		Aggradation Ratio							
	Plan Form	Sinuosity	1	0.00	0.00				
Physicochemical	Bacteria	E. Coli (Cfu/100 mL)				0.48	Functioning At Risk		
	Organic Enrichment	Percent Nutrient Tolerant Macroinvertebrates (%)	55.1	0.48	0.48				
	Nitrogen	Nitrate-Nitrite (mg/L)							
	Phosphorus	Total Phosphorus (mg/L)							
Biology	Macroinvertebrates	Tennessee Macroinvertebrate Index	18	0.28	0.28	0.28	Not Functioning		
		Percent Clingers (%)							
		Percent EPT - Cheumatopsyche (%)							
		Percent Oligochaeta and Chironomidae (%)							
	Fish	Native Fish Score Index							
		Catch per Unit Effort Score							

TN SQT v1.3
Quantification Tool Spreadsheet Reach 2

PROPOSED CONDITION ASSESSMENT					Roll Up Scoring				
Functional Category	**Function-Based Parameters**	**Measurement Method**	**Field Value**	**Index Value**	**Parameter**	**Category**	**Category**	**PCS**	**PCS**
Hydrology	Catchment Hydrology	Watershed Land Use Runoff Score	0.282	0.30	0.30	0.39	Functioning At Risk		
	Reach Runoff	Stormwater Infiltration	0.48	0.48	0.48				
Hydraulics	Floodplain Connectivity	Bank Height Ratio	1	1.00	1.00	1.00	Functioning		
		Entrenchment Ratio	5	1.00					
Geomorphology	Large Woody Debris	Large Woody Debris Index	240	0.81	0.81	0.69	Functioning At Risk	0.58	Functioning At Risk
		# Pieces							
	Lateral Migration	Erosion Rate (ft/yr)			1.00				
		Dominant BEHI/NBS	L/L	1.00					
		Percent Streambank Erosion (%)	5	1.00					
		Percent Armoring (%)							
	Riparian Vegetation	Left - Average Diameter at Breast Height (DBH; in)	1	0.11	0.66				
		Right - Average DBH (in)	1	0.11					
		Left - Buffer Width (feet)	99	0.80					
		Right - Buffer Width (feet)	125	0.85					
		Left - Tree Density (#/acre)	300	0.82					
		Right - Tree Density (#/acre)	300	0.82					
		Left - Native Herbaceous Cover (%)	80	1.00					
		Right - Native Herbaceous Cover (%)	80	1.00					
		Left - Native Shrub Cover (%)	25	0.54					
		Right - Native Shrub Cover (%)	25	0.54					
	Bed Material Characterization	Size Class Pebble Count Analyzer (p-value)							
	Bed Form Diversity	Pool Spacing Ratio	5	1.00	1.00				
		Pool Depth Ratio	2.5	1.00					
		Percent Riffle (%)	50	1.00					
		Aggradation Ratio							
	Plan Form	Sinuosity	1.1	0.00	0.00				
Physicochemical	Bacteria	E. Coli (Cfu/100 mL)				0.48	Functioning At Risk		
	Organic Enrichment	Percent Nutrient Tolerant Macroinvertebrates (%)	55.1	0.48	0.48				
	Nitrogen	Nitrate-Nitrite (mg/L)							
	Phosphorus	Total Phosphorus (mg/L)							
Biology	Macroinvertebrates	Tennessee Macroinvertebrate Index	18	0.28	0.28	0.28	Not Functioning		
		Percent Clingers (%)							
		Percent EPT - Cheumatopsyche (%)							
		Percent Oligochaeta and Chironomidae (%)							
	Fish	Native Fish Score Index							
		Catch per Unit Effort Score							

TN SQT v1.3
Quantification Tool Spreadsheet Reach 3

1. Users input values that are highlighted based on restoration potential
2. Users select values from a pull-down menu
3. Leave values blank for field values that were not measured
4. These field values do not apply to ephemeral channels.

Reference Standard Stratification

Project Name:	Lockeland Springs
Reach ID:	UT2
Upstream Latitude:	36.172057
Upstream Longitude:	-86.731001
Downstream Latitude:	36.172047
Downstream Longitude:	-86.731631
Existing Stream Type:	E
Proposed Stream Type:	C
Ecoregion:	71h
Drainage Area (sqmi):	0.1
Proposed Bed Material:	Gravel
Existing Stream Length (feet):	208.2
Proposed Stream Length (feet):	228.3
Proposed Stream Slope (%):	1.7
Proposed Flow Type:	Perennial/Intermittent
Data Collection Season:	January - June
Macro Collection Method:	SQKICK
Valley Type:	Unconfined Alluvial

FUNCTIONAL LIFT SUMMARY	
Exisiting Condition Score (ECS)	0.55
Proposed Condition Score (PCS)	0.68
Change in Functional Condition (PCS - ECS)	0.13
Existing Stream Length (feet)	208.2
Proposed Stream Length (feet)	228.3
Additional Stream Length (feet)	20.1
Existing Stream Functional Feet (FF)	115
Proposed Stream Functional Feet (FF)	155
Functional Lift (Proposed FF - Existing FF)	41

MITIGATION SUMMARY	
41	**Credits**

FUNCTION BASED PARAMETERS SUMMARY			
Functional Category	**Function-Based Parameters**	**Existing Parameter**	**Proposed Parameter**
Hydrology	Catchment Hydrology	0.53	0.53
	Reach Runoff	0.90	0.90
Hydraulics	Floodplain Connectivity	1.00	1.00
Geomorphology	Large Woody Debris	0.00	0.81
	Lateral Migration	0.47	1.00
	Riparian Vegetation	0.36	0.65
	Bed Material		
	Bed Form Diversity	0.46	1.00
	Sinuosity	0.00	1.00
Physicochemical	Bacteria		
	Organic Enrichment	0.48	0.48
	Nitrogen		
	Phosphorus		
Biology	Macroinvertebrates	0.28	0.28
	Fish		

FUNCTIONAL CATEGORY REPORT CARD			
Functional Category	**ECS**	**PCS**	**Functional Lift**
Hydrology	0.72	0.72	0.00
Hydraulics	1.00	1.00	0.00
Geomorphology	0.26	0.89	0.63
Physicochemical	0.48	0.48	0.00
Biology	0.28	0.28	0.00

TN SQT v1.3
Quantification Tool Spreadsheet Reach 3

EXISTING CONDITION ASSESSMENT					Roll Up Scoring				
Functional Category	**Function-Based Parameters**	**Measurement Method**	**Field Value**	**Index Value**	**Parameter**	**Category**	**Category**	**ECS**	**ECS**
Hydrology	Catchment Hydrology	Watershed Land Use Runoff Score	0.5	0.53	0.53	0.72	Functioning		
	Reach Runoff	Stormwater Infiltration	0.9	0.90	0.90				
Hydraulics	Floodplain Connectivity	Bank Height Ratio	1	1.00	1.00	1.00	Functioning		
		Entrenchment Ratio	5	1.00					
Geomorphology	Large Woody Debris	Large Woody Debris Index	0	0.00	0.00	0.26	Not Functioning	0.55	Functioning At Risk
		# Pieces							
	Lateral Migration	Erosion Rate (ft/yr)			0.47				
		Dominant BEHI/NBS	M/L	0.60					
		Percent Streambank Erosion (%)	20	0.34					
		Percent Armoring (%)							
	Riparian Vegetation	Left - Average Diameter at Breast Height (DBH; in)	0	0.00	0.36				
		Right - Average DBH (in)	0	0.00					
		Left - Buffer Width (feet)	121	0.84					
		Right - Buffer Width (feet)	98	0.80					
		Left - Tree Density (#/acre)	0	0.00					
		Right - Tree Density (#/acre)	0	0.00					
		Left - Native Herbaceous Cover (%)	80	1.00					
		Right - Native Herbaceous Cover (%)	80	1.00					
		Left - Native Shrub Cover (%)	0	0.00					
		Right - Native Shrub Cover (%)	0	0.00					
	Bed Material Characterization	Size Class Pebble Count Analyzer (p-value)							
	Bed Form Diversity	Pool Spacing Ratio	8	0.00	0.46				
		Pool Depth Ratio	2	0.70					
		Percent Riffle (%)	56.6	0.67					
		Aggradation Ratio							
	Plan Form	Sinuosity	1	0.00	0.00				
Physicochemical	Bacteria	E. Coli (Cfu/100 mL)				0.48	Functioning At Risk		
	Organic Enrichment	Percent Nutrient Tolerant Macroinvertebrates (%)	55.1	0.48	0.48				
	Nitrogen	Nitrate-Nitrite (mg/L)							
	Phosphorus	Total Phosphorus (mg/L)							
Biology	Macroinvertebrates	Tennessee Macroinvertebrate Index	18	0.28	0.28	0.28	Not Functioning		
		Percent Clingers (%)							
		Percent EPT - Cheumatopsyche (%)							
		Percent Oligochaeta and Chironomidae (%)							
	Fish	Native Fish Score Index							
		Catch per Unit Effort Score							

TN SQT v1.3
Quantification Tool Spreadsheet Reach 3

PROPOSED CONDITION ASSESSMENT					Roll Up Scoring				
Functional Category	**Function-Based Parameters**	**Measurement Method**	**Field Value**	**Index Value**	**Parameter**	**Category**	**Category**	**PCS**	**PCS**
Hydrology	Catchment Hydrology	Watershed Land Use Runoff Score	0.5	0.53	0.53	0.72	Functioning		
	Reach Runoff	Stormwater Infiltration	0.9	0.90	0.90				
Hydraulics	Floodplain Connectivity	Bank Height Ratio	1	1.00	1.00	1.00	Functioning		
		Entrenchment Ratio	5	1.00					
Geomorphology	Large Woody Debris	Large Woody Debris Index	240	0.81	0.81	0.89	Functioning	0.68	Functioning At Risk
		# Pieces							
	Lateral Migration	Erosion Rate (ft/yr)			1.00				
		Dominant BEHI/NBS	L/L	1.00					
		Percent Streambank Erosion (%)	5	1.00					
		Percent Armoring (%)							
	Riparian Vegetation	Left - Average Diameter at Breast Height (DBH; in)	1	0.11	0.65				
		Right - Average DBH (in)	1	0.11					
		Left - Buffer Width (feet)	100	0.80					
		Right - Buffer Width (feet)	69	0.74					
		Left - Tree Density (#/acre)	300	0.82					
		Right - Tree Density (#/acre)	300	0.82					
		Left - Native Herbaceous Cover (%)	80	1.00					
		Right - Native Herbaceous Cover (%)	80	1.00					
		Left - Native Shrub Cover (%)	25	0.54					
		Right - Native Shrub Cover (%)	25	0.54					
	Bed Material Characterization	Size Class Pebble Count Analyzer (p-value)							
	Bed Form Diversity	Pool Spacing Ratio	5	1.00	1.00				
		Pool Depth Ratio	2.5	1.00					
		Percent Riffle (%)	50	1.00					
		Aggradation Ratio							
	Plan Form	Sinuosity	1.2	1.00	1.00				
Physicochemical	Bacteria	E. Coli (Cfu/100 mL)				0.48	Functioning At Risk		
	Organic Enrichment	Percent Nutrient Tolerant Macroinvertebrates (%)	55.1	0.48	0.48				
	Nitrogen	Nitrate-Nitrite (mg/L)							
	Phosphorus	Total Phosphorus (mg/L)							
Biology	Macroinvertebrates	Tennessee Macroinvertebrate Index	18	0.28	0.28	0.28	Not Functioning		
		Percent Clingers (%)							
		Percent EPT - Cheumatopsyche (%)							
		Percent Oligochaeta and Chironomidae (%)							
	Fish	Native Fish Score Index							
		Catch per Unit Effort Score							

Appendix C

Functional Assessment Data Forms

Date:
Investigators:

TN SQT and Debit Tool Rapid Assessment Form

Version 1.2 January 2020

I. Reach Information and Stratification

Project Name:	Lockeland Springs
Reach ID:	UT1 Reach 1
Upstream Latitude:	36.17465
Upstream Longitude:	-86.732095
Downstream Latitude:	36.172774
Downstream Longitude:	-86.731109
Ecoregion:	71h
Drainage Area (sq. mi.):	1.02
Stream Reach Length (ft):	754.5
Flow Type:	Perennial/Intermittent
Valley Type:	Unconfined Alluvial

Shading Key
Desktop Value
Field Value
Calculation

II. Reach Walk

A.

Length of Armoring on banks (ft)						
Total (ft)						
Percent Armoring (%)						

B.

Difference between BKF stage and WS (ft)	Describe the bankfull indicator
N/A	Due to channel being made of concrete

Date:
Investigators:

TN SQT and Debit Tool Rapid Assessment Form

Version 1.2 January 2020

III. Bankfull Verification and Stable Riffle Cross Section

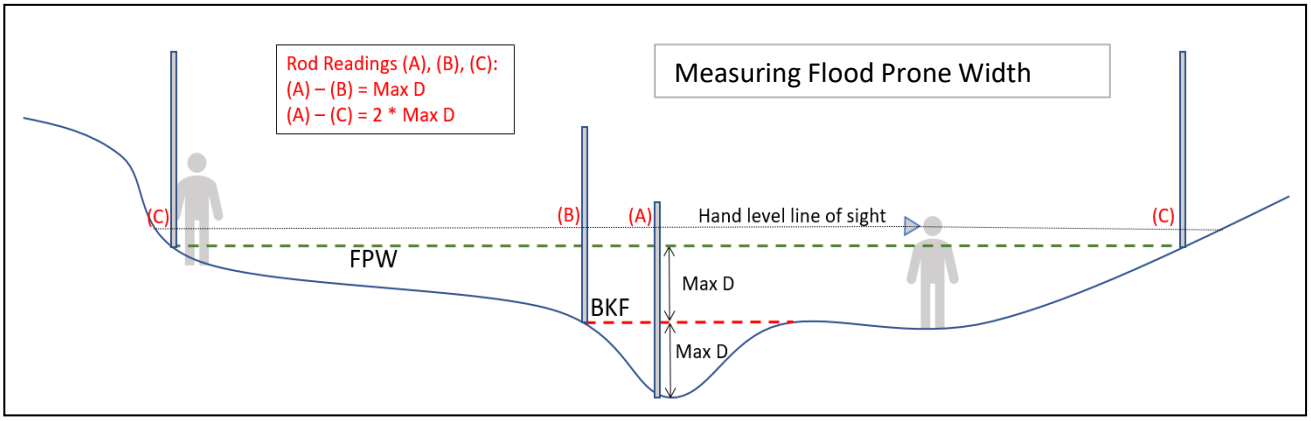
A.	Difference between BKF stage and WS (ft) *Average or consensus value from reach walk.*	N/A
B.	Bankfull Width (ft)	N/A
C.	Bankfull Mean Depth (ft) = Average of depth measurements	N/A
D.	Bankfull Area (sq. ft.) Width * Mean Depth	N/A
E.	Regional Curve Bankfull Width (ft)	
F.	Regional Curve Bankfull Mean Depth (ft)	
G.	Regional Curve Bankfull Area (sq. ft.)	
H.	Curve Used	

I.	Flood Prone Width (FPW; ft)	N/A
J.	Entrenchment Ratio (ER)	N/A
K.	Width Depth Ratio (WDR)	N/A
L.	Stream Type	N/A

Cross Section Measurements Depth measured from bankfull			
Station	Depth	Station	Depth

Quick Rosgen Stream Classification Guide (Rosgen, 1996)				
ER < 1.4		1.4 < ER < 2.2	ER > 2.2	
WDR < 12	WDR > 12	WDR > 12	WDR < 12	WDR > 12
A or G	F	B	E	C

Rosgen, D.L., 1996. Applied River Morphology, Wildland Hydrology Books, Pagosa Springs, Colorado.



IV. Riffle Data (Floodplain Connectivity & Bed Form Diversity)

A.

Assessment Segment Length At least 20 x the Bankfull Width	N/A		20*Bankfull Width	N/A

B. Bank Height & Riffle Data

	R1	R2	R3	R4	R5	R6	R7	R8
Begin Station (Distance along tape)	N/A							
End Station (Distance along tape)								
Low Bank Height (ft)								
Bankfull Max Depth (ft)								
Bankfull Width (ft)								
Flood Prone Width (ft)								
Bankfull Mean Depth (ft)								
Riffle Length (ft) *Including Run*								
Bank Height Ratio (BHR) Low Bank H / BKF Max D								
BHR * Riffle Length (ft)								
Entrenchment Ratio (ER)								
ER * Riffle Length (ft)								
WDR BKF Width / BKF Mean D								

Date:
Investigators:

TN SQT and Debit Tool Rapid Assessment Form

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IV. Riffle Data (Continued)

C.	Total Riffle Length (ft)	N/A
D.	**Weighted BHR** $\frac{\Sigma(Bank\ Height\ Ratio_i \times \text{Riffle Length}_i)}{\Sigma Riffle\ Length}$	N/A
E.	**Weighted ER**	N/A
F.	**Maximum WDR**	N/A
G.	**Percent Riffle (%)**	N/A

V. Slope

A.

	Begin	End	Difference	Slope (ft/ft)
Station along tape (ft)	N/A	N/A	N/A	
Stadia Rod Reading (ft)	N/A	N/A	N/A	

VI. Stream Type Classification

		Assessment Segment
A.	Entrenchment Ratio (ft/ft)	N/A
B.	Width Depth Ratio (ft/ft)	N/A
C.	Channel Material Estimate	N/A
D.	Stream Type (Rosgen, 1996)	N/A

VII. Pool Data (Bed Form Diversity)

A.

	P1	P2	P3	P4	P5	P6	P7	P8
Geomorphic Pool?								
Station At maximum pool depth	N/A							
P-P Spacing (ft)	X							
Pool Spacing Ratio Pool Spacing / BKF Width	X							
Pool Depth (ft) Measured from Bankfull								
Pool Depth Ratio Pool depth/BKF mean D								

B.	Average Pool Depth Ratio	N/A	C.	Median Pool Spacing Ratio	N/A

Date:
Investigators:

TN SQT and Debit Tool Rapid Assessment Form

Version 1.2 January 2020

VIII. Large Woody Debris

A.	Number of Pieces per 100m	N/A

IX. Lateral Migration

A. Bank Data

BEHI/NBS Score	Bank Length (ft)	BEHI/NBS Score	Bank Length (ft)
N/A			

B.	Dominant BEHI/NBS Score	N/A
C.	Total Eroding Bank Length (ft)	N/A
D.	Total Bank Length (ft)	N/A
E.	Percent Streambank Erosion (%) Total Eroding Bank Length/ Total Bank Length	N/A

X. Riparian Vegetation

A.

Buffer Width	Buffer Width Measurements (ft)							Avg.
	1	2	3	4	5	6	7	
Left (looking downstream)	N/A							
Right (looking downstream)	N/A							

XI. Sinuosity

A.	Stream Length (ft)	N/A
B.	Valley Length (ft)	N/A
C.	Sinuosity	N/A

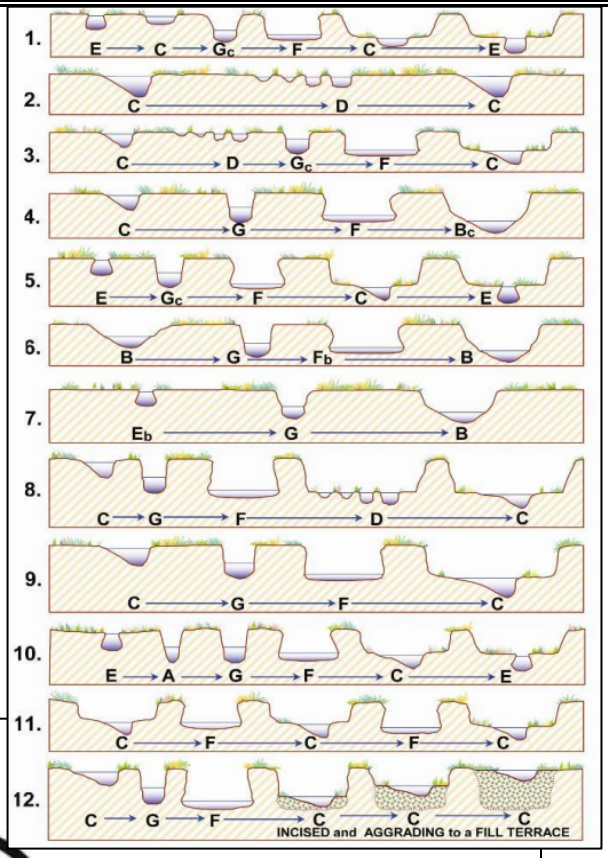
TN SQT and Debit Tool Rapid Assessment Form

Version 1.2 January 2020

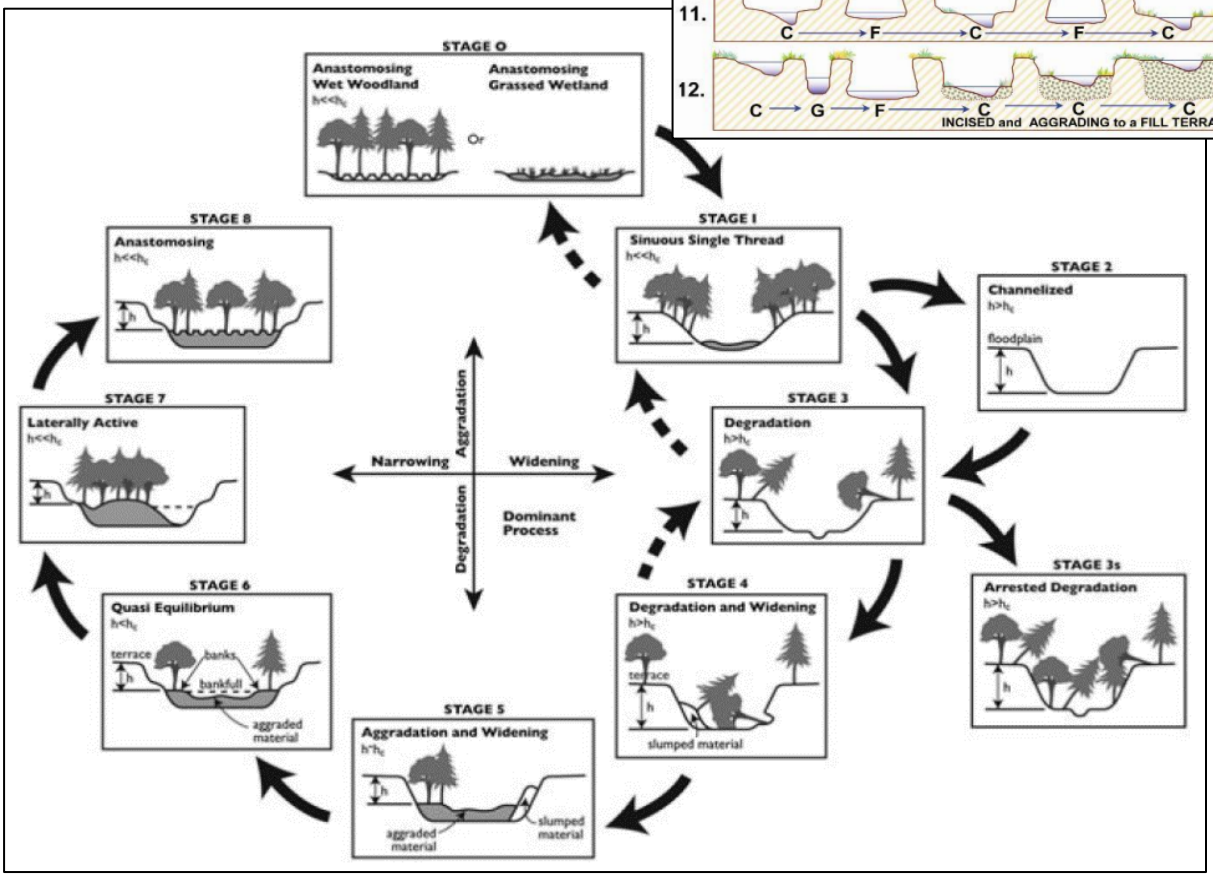
XII. Channel Evolution

A.	Rosgen Channel Type Succession	
	Simon Channel Evolution Model (Stage)	3

Rosgen Channel Type



Stream Evolution Model



1 *Figure 7-48, Watershed Assessment of River Stability and Sediment Supply (WARSSS),* by David L. Rosgen, Wildland Hydrology, 2009, p. 7-175.

2 B. Cluer, C. Thorne. "A Stream Evolution Model Integrating Habitat and Ecosystem Benefits." *River Research and Applications.* 2013.

LWD Field Form

Investigator(s)	Timothy Guess	State	TN	Survey Length	328 ft.
Date	11/29/2023	County	Davidson	Bkf Width	
Stream Name	UT1	Latitude (dd)		Bkf Mean Depth	
Reach ID	Reach 1	Longitude (dd)			
Field Notes:	No wood found.				

SCORE										
	1		2		3		4		5		
CATEGORY	*** PIECES ***										**PIECE SCORES**
Length/BKF Width	0 to 0.4		0.4 to 0.6		0.6 to 0.8		0.8 to 1.0		> 1.0		0
Diameter (cm)	10 to 20		20 to 30		30 to 40		40 to 50		>50		0
Location	Zone 4 (Above BKF/Extending into Channel)				Zone 3 (Above BKF/Within Streambanks)		Zone 2 (Above WS/Below BKF)		Zone 1 (Below WS)		0
Type	Bridge				Ramp		Submersed		Buried		0
Structure	Plain		Plain/Int		Intermediate		Int/Sticky		Sticky		0
Stability	Moveable		Mov/Int		Intermediate		Int/Sec		Secured		0
Orientation (deg)	0 to 20		20 to 40		40 to 60		60 to 80		80 to 90		0
CATEGORY	**** DEBRIS DAMS ****										**DAM SCORES**
Length (% of BKF Width)	0 to 20		20 to 40		40 to 60		60 to 80		80 to 100		0
Height (% of BKF Depth)	0 to 20		20 to 40		40 to 60		60 to 80		80 to 100		0
Structure	Coarse		Coarse/Int		Intermediate		Int/Fine		Fine		0
Location	Partially high flow		In high flow		Partially low flow		Mid low flow		In low flow		0
Stability	Moveable		Mov/Int		Intermediate		Int/Sec		Secured		0

* Pieces - Non-living wood that has a large end diameter a 10 cm and has a length a 1 m. " Debris Dams - Three (3) or more pieces touching.

LWDI SCORE	**0**

Plot Data: CVS Level 3

General Information

Project Number:

Project Name: Lockeland Springs PRM

Team: KCI Technologies

Plot: UT1 Reach 1 LB

Start Date: 29/ Nov/2023

Party	Role**
Josh Sitz	Plot Leader

**Roles: Co-leader, Assistant, Guide, Land owner, Taxonomist, Other

Soil Drainage*

- ☐ Excessively drained
- ☐ Somewhat excessively
- ☐ Well drained
- ☑ Moderately well d.
- ☐ Somewhat poorly d.
- ☐ Poorly drained
- ☐ Very poorly drained

Salinity*

- ☐ Saltwater
- ☐ Brackish
- ☑ Fresh
- ☐ Upland (n/a)

Soil Series / Type:

Soil Series Source:

Soil Texture*:

Rock Type*:

Surficial Deposits*:

Soil Descr.:

Location

General: Nashville

State: TN County: Davidson

Quadrangle:

Place Names: 1)

2) 3)

EEP Reach:

Land Owner:

Source of coordinates: GPS (map, GPS, survey)

GPS location in plot (meters): x= 0 y= 0

Coordinate System: ☑ Lat/Long ☐ UTM ☐ State Plane ☐ Other (*specify*): _____

Coord. Units: ☑ deg. ☐ deg. min. ☐ m ☐ ft ☐ _____

Datum: ☑ NAD83/WGS84 ☐ NAD27

Zone: (if applicable)

Lat: 36.174337 **(or Northing)**

Long: -86.731595 **(or Easting)**

Coordinate Accuracy (m radius): 1m

GPS File Name:

Site Characteristics

Elevation: ± ☐m ☐ft

Slope (degrees):

Aspect (degrees):

Compass Type: ☐ magnetic ☐ true

Classification* Fit:excellent,good, fair, poor; Conf: high, med, low

Provisional comm._____

Comm.(1)_____Fit=__Conf=__

Comm.(2)_____Fit=__Conf=__

Classifier _____ Date ___/___/___

Taxonomic Standard Used for Plants

Authority: ITIS, **Publ. Date:** 11/8/17

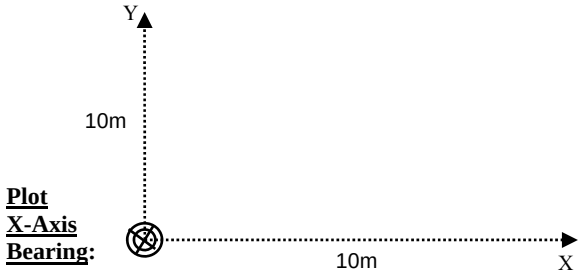
Plot Placement:

(check 1 or more)

- ☑ Representative
- ☐ Random
- ☐ Stratified
- ☐ Transect component
- ☐ Systematic (grid)
- ☐ Capture specific feature

Plot Diagram:

Draw plot boundaries and show location of any landmarks and objects in the key below. Also indicate X and Y dimensions of plot, in meters.



●Posts (x,y) (meters)
(0 , 0)
(10, 0)
(10 , 10)
(0 , 10)
(,)
(,)

Key: ◎ Plot origin (0,0) point ⊗ GPS location point ◯→ Photo taken, with direction ● Location of posts

Plot Size (ares): 1

◯→ Photo Identifier(s):

Topographic Position*

- ☐ Interfluve (crest, summit, ridge)
- ☐ High slope (shoulder, upper, convex)
- ☐ High level
- ☐ Midslope
- ☐ Backslope (cliff)
- ☐ Step in slope
- ☐ Lowslope (lower, foot, colluvial)
- ☐ Toeslope
- ☐ Low level (terrace)
- ☐ Channel wall (bank)
- ☐ Channel bed (valley bottom)
- ☐ Basin floor (depression)
- ☐ *Other:* _____

Cover by Strata

Canopy Height (m):

Strata	Height Range (ft)	Total Cover (%)
Tree	X	0%
Shrub	X	0%
Herb	X	100%
(**F**loating)	-	
(**A**quatic Submerged)	-	

Height defaults listed, but can be edited if other values better suit vegetation.

Hydrologic Regime*

- ☐ Upland (seldom flooded)
- ☐ Intermittently/seasonally saturated (seldom flooded)
- ☐ Permanently/ semipermanently saturated (dry < 1 / yr, seldom flooded)
- ☐ Occasionally flooded (<1 / yr)
- ☐ Temporarily flooded
- ☐ Intermittently flooded
- ☐ Semipermanently flooded
- ☐ Permanently flooded
- ☐ Tidally flooded - daily
- ☐ Tidally flooded - monthly
- ☐ Tidally flooded - irregular (wind, storms)
- ☐ Unknown

Water

Percent of Plot Submerged: 0 %

Mean Water Depth Now: 0 cm

Closest Dist. to Shore: 0 m

Landform Type*:

Notes

If more space is needed, check the box and use back of datasheets

Date plot was last planted (MM/YYYY): (baseline or if since last monitoring)

Layout: (anything unusual about plot layout and shape) ☐ more...

Plot Location: (directions to plot, landscape content) ☐ more...

Plot Rationale: (why location was chosen for the plot) ☐ more...

Vegetation: (characterization of community, dominants, and principle strata) ☐ more...

Natural Woody Stem Data: CVS Levels 2 - 3

Team: KCI Leader: JS Project: Lockeland Springs PRM Plot: UT1 R1 LB Date: 11/29/2023 Area (=100m²): 1

Species Name		Seedlings - Height Class			Saplings - DBH										
Common Name	**Scientific Name**	10-50cm 3.9-19.7in	50-100cm 19.7-39.4in	100-137cm 39.4-53.9in	0-1cm 0-0.4in	1-2.5cm 0.4-1.0in	2.5-5cm 1.0-2.0in	5-10cm 2.0-3.9in	10-15cm 3.9-5.9in	15-20cm 5.9-7.9in	20-25cm 7.9-9.8in	25-30cm 9.8-11.8in	30-35cm 11.8-13.8in	35-40cm 13.8-15.7in	>40cm >15.7in
	None														
Total		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Average DBH by Class (cm)					#DIV/0!		#DIV/0!								
Average DBH (inches)					**#DIV/0!**										
Stem Density					**0.0**										

Team: KCI Leader: JS Project: Lockeland Springs PRM Plot: UT1 R1 LB Date: 11/29/2023 Ares (=100m²): 1

Strata					Species Name		Invasive	Modules		
T	S	H	(F)	(A)	Common Name	Scientific Name				
		*			Kentucky bluegrass	*Poa pratensis*	NO			

Cover: trace=1; 0-1%=2; 1-2%=3; 2-5%=4; 5-10%=5; 10-25%=6; 25-50%=7; 50-75%=8; 75-95%=9; 95-100%=*

Plot Data: CVS Level 3

General Information

Project Number:

Project Name: Lockeland Springs PRM

Team: KCI Technologies

Plot: UT1 Reach 1 RB

Start Date: 29/ Nov/2023

Party	Role**
Josh Sitz	Plot Leader

**Roles: Co-leader, Assistant, Guide, Land owner, Taxonomist, Other

Soil Drainage*

- ☐ Excessively drained
- ☐ Somewhat excessively
- ☐ Well drained
- ☑ Moderately well d.
- ☐ Somewhat poorly d.
- ☐ Poorly drained
- ☐ Very poorly drained

Salinity*

- ☐ Saltwater
- ☐ Brackish
- ☑ Fresh
- ☐ Upland (n/a)

Soil Series / Type:

Soil Series Source:

Soil Texture*:

Rock Type*:

Surficial Deposits*:

Soil Descr.:

Location

General: Nashville

State: TN County: Davidson

Quadrangle:

Place Names: 1)

2) 3)

EEP Reach:

Land Owner:

Source of coordinates: GPS (map, GPS, survey)

GPS location in plot (meters): x= 0 y= 0

Coordinate System: ☑ Lat/Long ☐ UTM ☐ State Plane ☐ Other (*specify*): _____

Coord. Units: ☑ deg. ☐ deg. min. ☐ m ☐ ft ☐ _____

Datum: ☑ NAD83/WGS84 ☐ NAD27

Zone: (if applicable)

Lat: 36.174094 **(or Northing)**

Long: -86.731595 **(or Easting)**

Coordinate Accuracy (m radius): 1m

GPS File Name:

Site Characteristics

Elevation: ± ☐m ☐ft

Slope (degrees):

Aspect (degrees):

Compass Type: ☐ magnetic ☐ true

Classification* Fit:excellent,good, fair, poor; Conf: high, med, low

Provisional comm._____

Comm.(1)_____Fit=__Conf=__

Comm.(2)_____Fit=__Conf=__

Classifier _____ Date ___/___/___

Taxonomic Standard Used for Plants

Authority: ITIS, **Publ. Date:** 11/8/17

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(check 1 or more)

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- ☐ Stratified
- ☐ Transect component
- ☐ Systematic (grid)
- ☐ Capture specific feature

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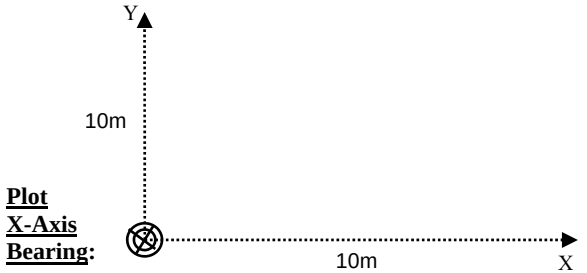

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(0 , 0)
(10, 0)
(10 , 10)
(0 , 10)
(,)
(,)

Key: ◎ Plot origin (0,0) point ⊗ GPS location point → Photo taken, with direction ● Location of posts

Plot Size (ares): 1

→ Photo Identifier(s):

Topographic Position*

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- ☐ High slope (shoulder, upper, convex)
- ☐ High level
- ☐ Midslope
- ☐ Backslope (cliff)
- ☐ Step in slope
- ☐ Lowslope (lower, foot, colluvial)
- ☐ Toeslope
- ☐ Low level (terrace)
- ☐ Channel wall (bank)
- ☐ Channel bed (valley bottom)
- ☐ Basin floor (depression)
- ☐ *Other:* _____

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Strata	Height Range (ft)	Total Cover (%)
Tree	X	0%
Shrub	X	0%
Herb	X	100%
(**F**loating)	-	
(**A**quatic Submerged)	-	

Height defaults listed, but can be edited if other values better suit vegetation.

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- ☐ Intermittently/seasonally saturated (seldom flooded)
- ☐ Permanently/ semipermanently saturated (dry < 1 / yr, seldom flooded)
- ☐ Occasionally flooded (<1 / yr)
- ☐ Temporarily flooded
- ☐ Intermittently flooded
- ☐ Semipermanently flooded
- ☐ Permanently flooded
- ☐ Tidally flooded - daily
- ☐ Tidally flooded - monthly
- ☐ Tidally flooded - irregular (wind, storms)
- ☐ Unknown

Water

Percent of Plot Submerged: 0 %

Mean Water Depth Now: 0 cm

Closest Dist. to Shore: 0 m

Landform Type*:

Notes

If more space is needed, check the box and use back of datasheets

Date plot was last planted (MM/YYYY): (baseline or if since last monitoring)

Layout: (anything unusual about plot layout and shape) ☐ more...

Plot Location: (directions to plot, landscape content) ☐ more...

Plot Rationale: (why location was chosen for the plot) ☐ more...

Vegetation: (characterization of community, dominants, and principle strata) ☐ more...

Natural Woody Stem Data: CVS Levels 2 - 3

Team: KCI Leader: JS Project: Lockeland Springs PRM Plot: UT1 R1 RB Date: 11/29/2023 Area (=100m²): 1

Species Name		Seedlings - Height Class			Saplings - DBH										
Common Name	**Scientific Name**	10-50cm 3.9-19.7in	50-100cm 19.7-39.4in	100-137cm 39.4-53.9in	0-1cm 0-0.4in	1-2.5cm 0.4-1.0in	2.5-5cm 1.0-2.0in	5-10cm 2.0-3.9in	10-15cm 3.9-5.9in	15-20cm 5.9-7.9in	20-25cm 7.9-9.8in	25-30cm 9.8-11.8in	30-35cm 11.8-13.8in	35-40cm 13.8-15.7in	>40cm >15.7in
	None														
Total		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Average DBH by Class (cm)					#DIV/0!		#DIV/0!								
Average DBH (inches)					**#DIV/0!**										
Stem Density					**0.0**										

Team: KCI Leader: JS Project: Lockeland Springs PRM Plot: UT1 R1 RB Date: 11/29/2023 Ares (=100m²): 1

Strata					Species Name		Invasive	Modules		
T	S	H	(F)	(A)	Common Name	Scientific Name				
		*			Kentucky bluegrass	*Poa pratensis*	NO			

Cover: trace=1; 0-1%=2; 1-2%=3; 2-5%=4; 5-10%=5; 10-25%=6; 25-50%=7; 50-75%=8; 75-95%=9; 95-100%=*

Date:
Investigators:

TN SQT and Debit Tool Rapid Assessment Form

Version 1.2 January 2020

I. Reach Information and Stratification

Project Name:	Lockeland Springs
Reach ID:	UT1 Reach 2
Upstream Latitude:	36.172774
Upstream Longitude:	-86.731109
Downstream Latitude:	36.171166
Downstream Longitude:	-86.730851
Ecoregion:	71h
Drainage Area (sq. mi.):	1.13
Stream Reach Length (ft):	591.73
Flow Type:	Perennial/Intermittent
Valley Type:	Unconfined Alluvial

Shading Key
Desktop Value
Field Value
Calculation

II. Reach Walk

A.

Length of Armoring on banks (ft)		45	48	18			
Total (ft)	111.0						
Percent Armoring (%)	9%						

B.

Difference between BKF stage and WS (ft)	Describe the bankfull indicator
1.5	Consistent inflection point that was seen throughout reach
1.2	Consistent inflection point that was seen throughout reach
1.2	Consistent inflection point that was seen throughout reach
1.3	Consistent inflection point that was seen throughout reach
1.3	Consistent inflection point that was seen throughout reach
1.2	Consistent inflection point that was seen throughout reach
1.1	Consistent inflection point that was seen throughout reach
1.3	Consistent inflection point that was seen throughout reach

Date:
Investigators:

TN SQT and Debit Tool Rapid Assessment Form

Version 1.2 January 2020

III. Bankfull Verification and Stable Riffle Cross Section

A.	Difference between BKF stage and WS (ft) *Average or consensus value from reach walk.*	1.4
B.	Bankfull Width (ft)	12.1
C.	Bankfull Mean Depth (ft) = Average of depth measurements	1.2
D.	Bankfull Area (sq. ft.) Width * Mean Depth	14.7
E.	Regional Curve Bankfull Width (ft)	19.1
F.	Regional Curve Bankfull Mean Depth (ft)	1.2
G.	Regional Curve Bankfull Area (sq. ft.)	23.0
H.	Curve Used	71h

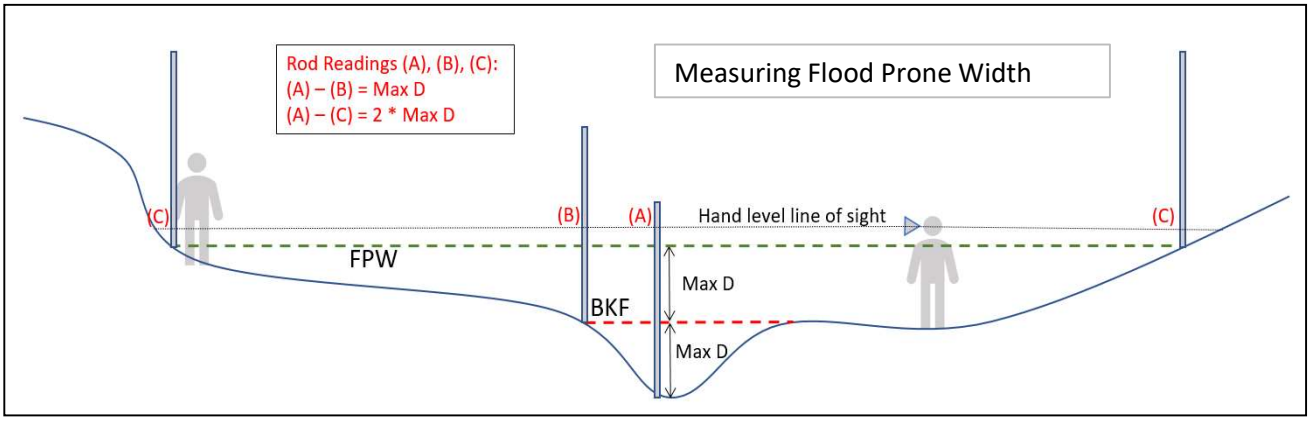
I.	Flood Prone Width (FPW; ft)	20.1
J.	Entrenchment Ratio (ER)	1.7
K.	Width Depth Ratio (WDR)	10.1
L.	Stream Type	Gc4

Cross Section Measurements
Depth measured from bankfull

Station	Depth	Station	Depth
7.56615	0	19.7154	0
8.80908	0.635		
9.66683	1.446		
11.358	1.496		
12.5615	1.459		
13.7115	1.49		
15.195	1.513		
16.6972	1.428		
17.7346	1.26		
18.2361	1.23		
18.7373	1.027		
19.3692	0.185		

Quick Rosgen Stream Classification Guide (Rosgen, 1996)				
ER < 1.4		1.4 < ER < 2.2	ER > 2.2	
WDR < 12	WDR > 12	WDR > 12	WDR < 12	WDR > 12
A or G	F	B	E	C

Rosgen, D.L., 1996. Applied River Morphology, Wildland Hydrology Books, Pagosa Springs, Colorado.



Date:
Investigators:

TN SQT and Debit Tool Rapid Assessment Form

Version 1.2 January 2020

IV. Riffle Data (Floodplain Connectivity & Bed Form Diversity)

A.

Assessment Segment Length At least 20 x the Bankfull Width	386.995		20*Bankfull Width	243.0

B. Bank Height & Riffle Data

	R1	R2	R3	R4	R5	R6	R7	R8
Begin Station (Distance along tape)	0.0	61.6	146.6	188.8	235.0			
End Station (Distance along tape)	46.7	83.2	175.1	198.8	263.1			
Low Bank Height (ft)	3.6	3.4	3.0	3.2	2.6			
Bankfull Max Depth (ft)	1.513	1.289	1.439	1.474	1.29			
Bankfull Width (ft)	12.1	12.4	13.2	14.1	15.4			
Flood Prone Width (ft)	20.1	19	21.5	24.25	27.8			
Bankfull Mean Depth (ft)	1.2	1.3	1.3	1.5	1.6			
Riffle Length (ft) *Including Run*	46.7	21.6	28.5	10.0	28.1			
Bank Height Ratio (BHR) Low Bank H / BKF Max D	2.4	2.6	2.1	2.2	2.0			
BHR * Riffle Length (ft)	110.2	56.9	59.4	21.7	56.8			
Entrenchment Ratio (ER)	1.7	1.5	1.6	1.7	5.0			
ER * Riffle Length (ft)	77.5	33.1	46.4	17.1	140.6			
WDR BKF Width / BKF Mean D	10.1	9.5	10.1	9.4	9.6			

Date:
Investigators:

TN SQT and Debit Tool Rapid Assessment Form

Version 1.2 January 2020

IV. Riffle Data (Continued)

C.	Total Riffle Length (ft)	134.8
D.	**Weighted BHR** $\frac{\Sigma(Bank\ Height\ Ratio_i \times \text{Riffle Length}_i)}{\Sigma Riffle\ Length}$	2.3
E.	**Weighted ER**	2.3
F.	**Maximum WDR**	10.1
G.	**Percent Riffle (%)**	35%

V. Slope

A.

	Begin	End	Difference	Slope (ft/ft)
Station along tape (ft)	0	387.0	387.0	0.004
Stadia Rod Reading (ft)	97.1	95.4	1.7	

VI. Stream Type Classification

		Assessment Segment
A.	Entrenchment Ratio (ft/ft)	1.7
B.	Width Depth Ratio (ft/ft)	10.1
C.	Channel Material Estimate	Gravel
D.	Stream Type (Rosgen, 1996)	Gc4

VII. Pool Data (Bed Form Diversity)

A.

	P1	P2	P3	P4	P5	P6	P7	P8
Geomorphic Pool?								
Station At maximum pool depth	51.3	124.2	177.0	219.3	342.6			
P-P Spacing (ft)	X							
Pool Spacing Ratio Pool Spacing / BKF Width	X							
Pool Depth (ft) Measured from Bankfull	1.7	2.0	1.9	2.1	2.3			
Pool Depth Ratio Pool depth/BKF mean D	1.4	1.7	1.6	1.7	1.9			

B.	Average Pool Depth Ratio	1.7	C.	Median Pool Spacing Ratio	0.0

Date:
Investigators:

TN SQT and Debit Tool Rapid Assessment Form

Version 1.2 January 2020

VIII. Large Woody Debris

A.	Number of Pieces per 100m	0

IX. Lateral Migration

A. Bank Data

BEHI/NBS Score	Bank Length (ft)	BEHI/NBS Score	Bank Length (ft)
28 (M)/H	10	24.5 (M)/M	64
20.5 (M)/M	18		
26.5 (M)/M	11		
20.5 (M)/M	48		
24.5 (M)/M	24		
28.5 (M)/M	79		

B.	Dominant BEHI/NBS Score	M/H
C.	Total Eroding Bank Length (ft)	254
D.	Total Bank Length (ft)	774.0
E.	Percent Streambank Erosion (%) Total Eroding Bank Length/ Total Bank Length	33%

X. Riparian Vegetation

A.

Buffer Width	Buffer Width Measurements (ft)							Avg.
	1	2	3	4	5	6	7	
Left (looking downstream)	91							91.0
Right (looking downstream)	89							89.0

XI. Sinuosity

A.	Stream Length (ft)	580.5
B.	Valley Length (ft)	557.78
C.	Sinuosity	1.04

Date:
Investigators:

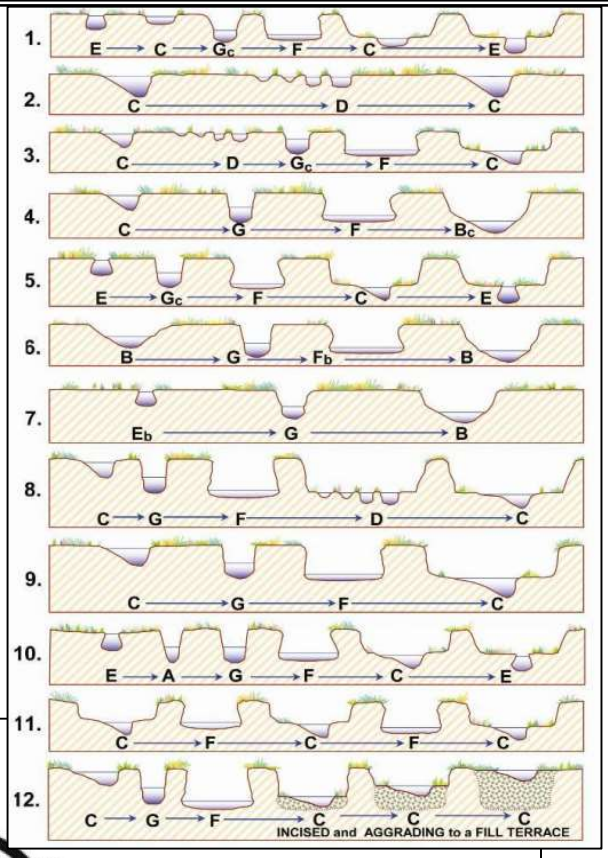
TN SQT and Debit Tool Rapid Assessment Form

Version 1.2 January 2020

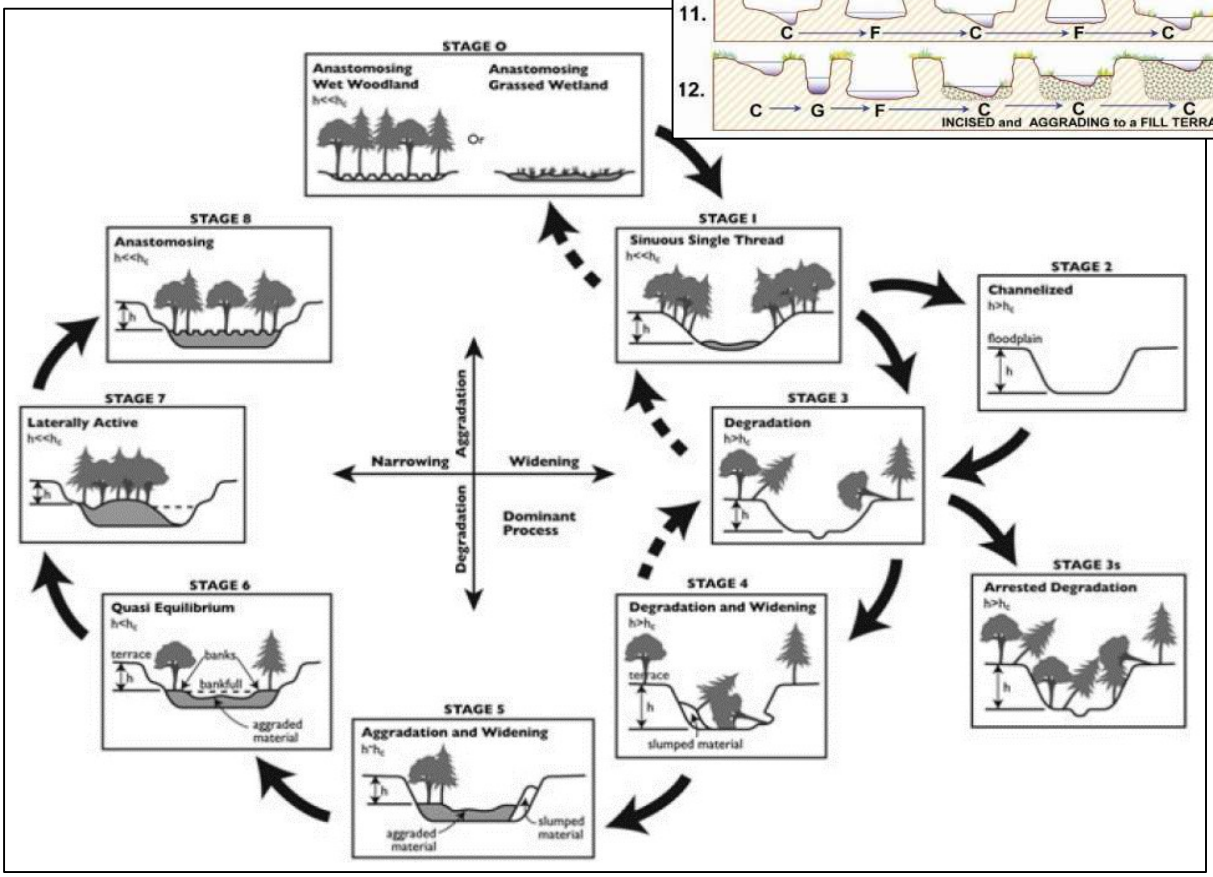
XII. Channel Evolution

A.	Rosgen Channel Type Succession	9
	Simon Channel Evolution Model (Stage)	4

Rosgen Channel Type

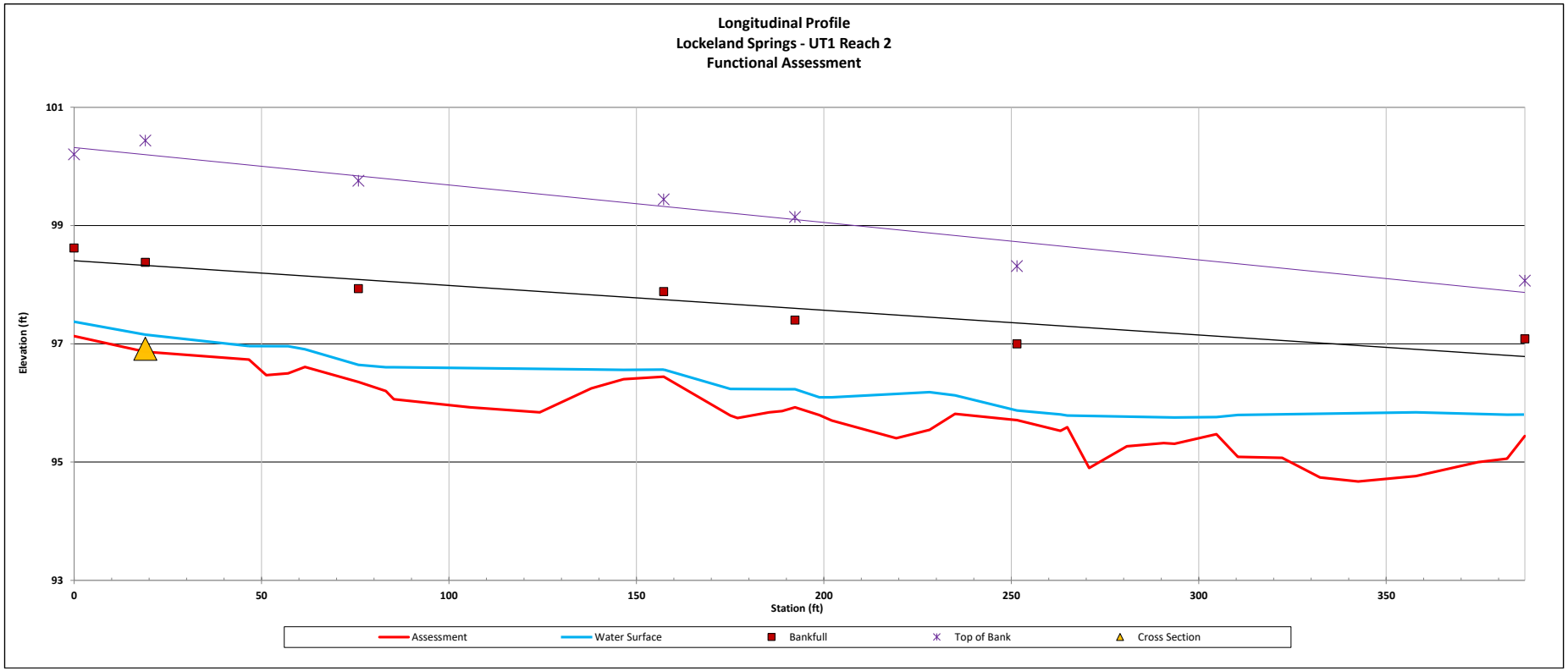


Stream Evolution Model



1 *Figure 7-48, Watershed Assessment of River Stability and Sediment Supply (WARSSS),* by David L. Rosgen, Wildland Hydrology, 2009, p. 7-175.

2 B. Cluer, C. Thorne. "A Stream Evolution Model Integrating Habitat and Ecosystem Benefits." *River Research and Applications.* 2013.

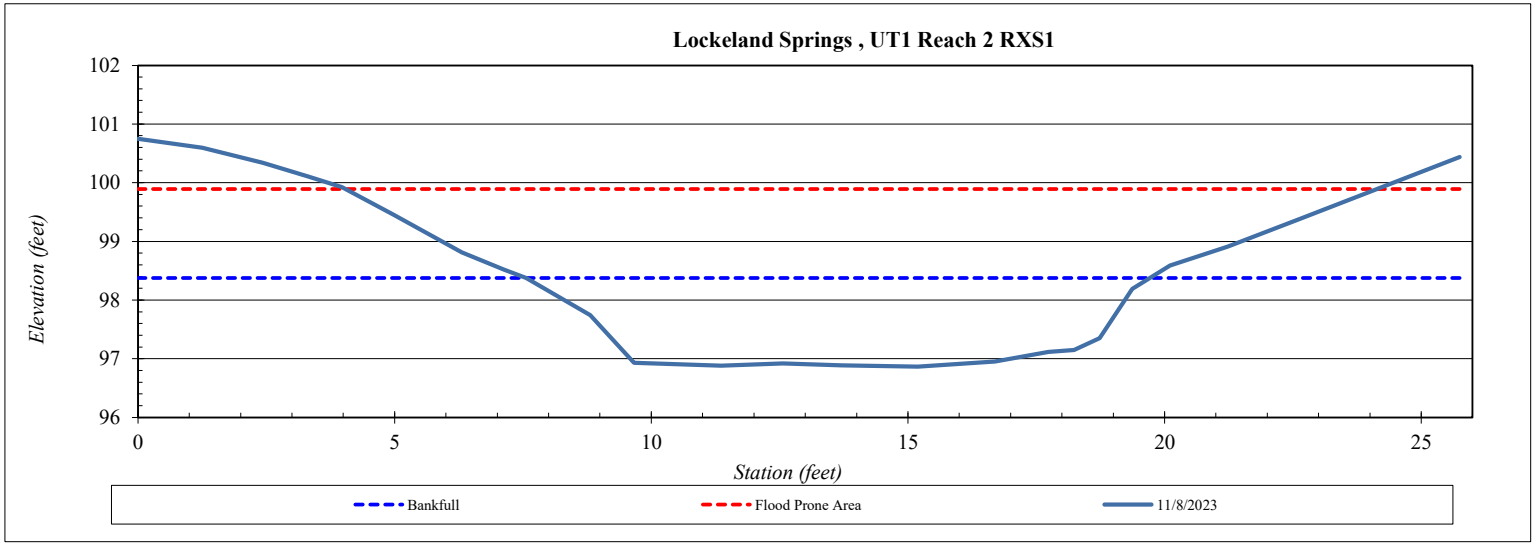

Longitudinal Profile
Lockeland Springs - UT1 Reach 2
Functional Assessment
Elevation (ft)
101
99
97
95
93
0
50
100
150
200
250
300
350
Station (ft)
Assessment
Water Surface
Bankfull
Top of Bank
Cross Section

Cross-Section Plots

River Basin:	Lower Cumberland-Sycamore
Site:	Lockeland Springs
XS ID	UT1 Reach 2 RXS1
Drainage Area (sq mi):	0.9
Date:	11/8/2023
Field Crew:	J. Sitz, T. Guess, E. White

Station	Elevation
0.00	100.75
1.25	100.60
2.43	100.34
3.30	100.11
3.98	99.93
4.97	99.46
6.31	98.81
7.14	98.52
7.57	98.38
8.81	97.74
9.67	96.93
11.36	96.88
12.56	96.92
13.71	96.89
15.19	96.87
16.70	96.95
17.73	97.12
18.24	97.15
18.74	97.35
19.37	98.19
20.11	98.59
21.23	98.91
22.63	99.38
25.74	100.44

SUMMARY DATA	
Bankfull Elevation:	98.38
Bankfull Cross-Sectional Area:	14.7
Bankfull Width:	12.1
Flood Prone Area Elevation:	99.9
Flood Prone Width:	20.1
Max Depth at Bankfull:	1.5
Mean Depth at Bankfull:	1.2
W / D Ratio:	10.1
Entrenchment Ratio:	1.7
Bank Height Ratio:	2.4



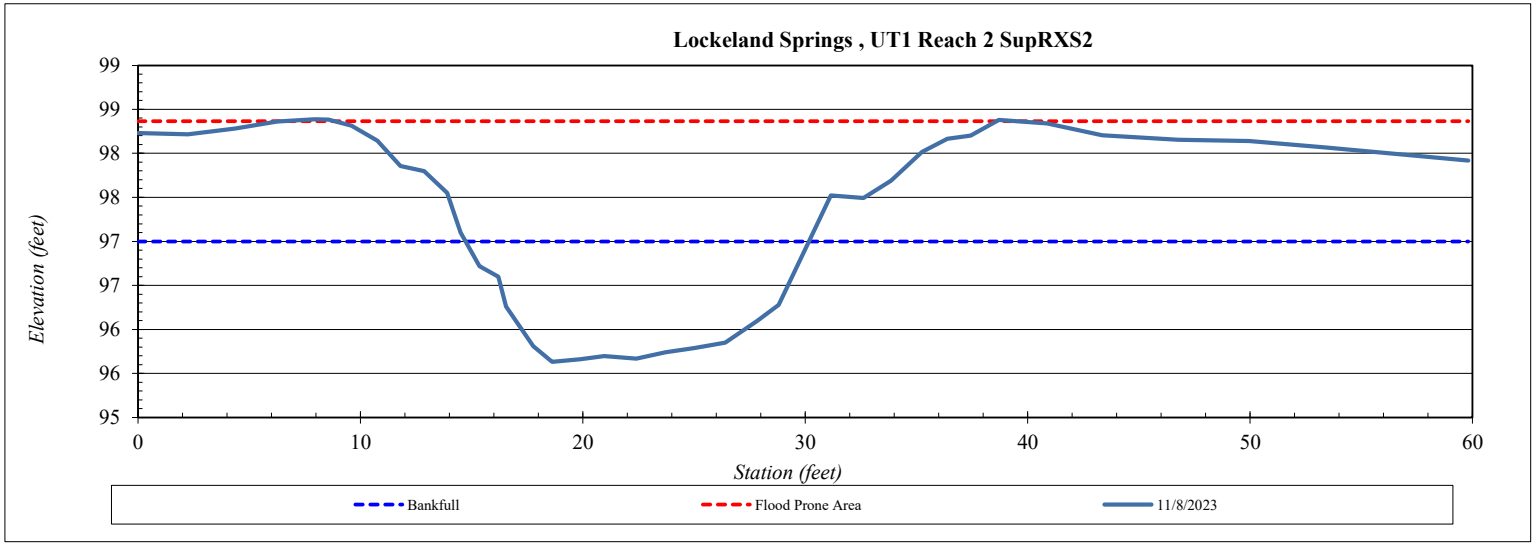
Cross-Section Plots

River Basin:	Lower Cumberland-Sycamore
Site:	Lockeland Springs
XS ID	UT1 Reach 2 SupRXS2
Drainage Area (sq mi):	0.95
Date:	11/8/2023
Field Crew:	J. Sitz, T. Guess, E. White

Station	Elevation
0.00	98.23
2.25	98.22
4.36	98.28
6.26	98.36
7.95	98.39
8.56	98.38
9.59	98.32
10.76	98.14
11.80	97.86
12.86	97.80
13.90	97.55
14.50	97.10
15.35	96.72
16.20	96.60
16.55	96.26
17.77	95.81
18.62	95.63
19.87	95.66
20.96	95.70
22.40	95.67
23.72	95.74
25.01	95.79
26.40	95.85
27.83	96.10
28.80	96.28
30.15	96.99
31.15	97.52
32.62	97.49
33.85	97.69
35.25	98.02
36.38	98.17
37.44	98.20
38.70	98.38
40.87	98.34
43.34	98.21

*not all shots are shown

SUMMARY DATA	
Bankfull Elevation:	97.00
Bankfull Cross-Sectional Area:	15.6
Bankfull Width:	15.4
Flood Prone Area Elevation:	98.4
Flood Prone Width:	27.8
Max Depth at Bankfull:	1.4
Mean Depth at Bankfull:	1.0
W / D Ratio:	15.3
Entrenchment Ratio:	1.8
Bank Height Ratio:	2.0



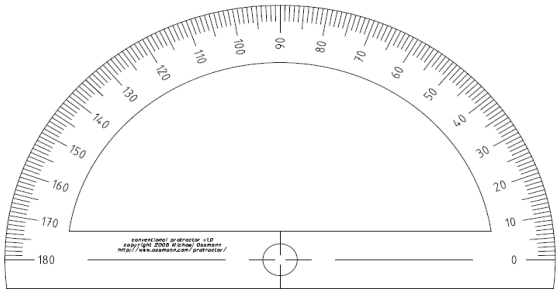
BEHI Field Form - Complete

Location description: Lockeland Springs UT1 R2 BEHI#1 Analysis by: JGS Date: 11/8/2023

Latitude: Longitude:

BEHI category	A		B		C		D		E	
	Bank height	BH score	Root depth	RDH score	Root density	RD score	Surface protection	SP score	Bank angle	BA score
Very low	1.0 – 1.1	1 ○	90 - 100	1 ○	80 - 100	1 ○	80 - 100	1 ○	0 - 20	1 ○
Low	1.1 – 1.2	3 ○	50 - 89	3 ◉	55 - 79	3 ◉	55 - 79	3 ○	21 - 60	3 ○
Moderate	1.3 – 1.5	5 ○	30 - 49	5 ○	30 - 54	5 ○	30 - 54	5 ◉	61 - 80	5 ○
High	1.6 – 2.0	7 ○	15 - 29	7 ○	15 - 29	7 ○	15 - 29	7 ○	81 - 90	7 ○
Very high	2.1 – 2.8	8.5 ◉	5 - 14	8.5 ○	5 - 14	8.5 ○	10 - 14	8.5 ○	91 - 119	8.5 ◉
Extreme	> 2.8	10 ○	< 5	10 ○	< 5	10 ○	< 14	10 ○	> 119	10 ○

Material adjustment (F)			Stratification adjustment (G)		Total Score (Sum A-G)
Bedrock - automatically	Very low	○	No layer	◉ No adjustment	28
Boulder - automatically	Low	○	Single layer	○ (+) 5	
Cobble	(-) 10	○	Multiple layers	○ (+) 10	
Gravel or mostly gravel	(+) 5	○			
Sand or mostly sands	(+) 10	○			
Silt/loam	No adjustment	◉			
Clay	(-) 20	○			



BEHI Category: Mod-NBS-Low

Very low	Low	Moderate	High	Very high	Extreme
≤ 9.5	10 - 19.5	20 - 29.5	30 - 39.5	40 - 45	> 45

Comments:

10' Eroding Left Bank
Left Bank Armoring 45' starting at top of pro

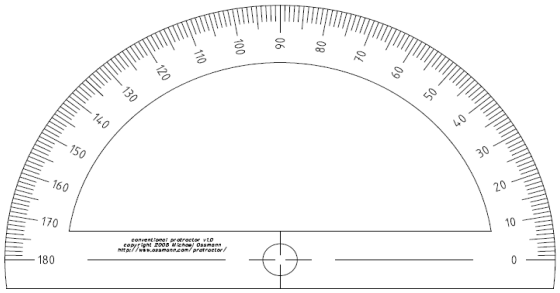
BEHI Field Form - Complete

Location description: Lockeland Springs UT1 R2 BEHI#2 Analysis by: JGS Date: 11/8/2023

Latitude: Longitude:

BEHI category	A		B		C		D		E	
	Bank height	BH score	Root depth	RDH score	Root density	RD score	Surface protection	SP score	Bank angle	BA score
Very low	1.0 – 1.1	1 ○	90 - 100	1 ○	80 - 100	1 ○	80 - 100	1 ◉	0 - 20	1 ○
Low	1.1 – 1.2	3 ○	50 - 89	3 ◉	55 - 79	3 ○	55 - 79	3 ○	21 - 60	3 ◉
Moderate	1.3 – 1.5	5 ○	30 - 49	5 ○	30 - 54	5 ◉	30 - 54	5 ○	61 - 80	5 ○
High	1.6 – 2.0	7 ○	15 - 29	7 ○	15 - 29	7 ○	15 - 29	7 ○	81 - 90	7 ○
Very high	2.1 – 2.8	8.5 ◉	5 - 14	8.5 ○	5 - 14	8.5 ○	10 - 14	8.5 ○	91 - 119	8.5 ○
Extreme	> 2.8	10 ○	< 5	10 ○	< 5	10 ○	< 14	10 ○	> 119	10 ○

Material adjustment (F)			Stratification adjustment (G)		Total Score (Sum A-G)
Bedrock - automatically	Very low	○	No layer	◉ No adjustment	20.5
Boulder - automatically	Low	○	Single layer	○ (+) 5	
Cobble	(-) 10	○	Multiple layers	○ (+) 10	
Gravel or mostly gravel	(+) 5	○			
Sand or mostly sands	(+) 10	○			
Silt/loam	No adjustment	◉			
Clay	(-) 20	○			



BEHI Category: Mod-NBS-Mod

Very low	Low	Moderate	High	Very high	Extreme
≤ 9.5	10 - 19.5	20 - 29.5	30 - 39.5	40 - 45	> 45

Comments:

18' Eroding Right Bank or
Right Bank Armoring 18'

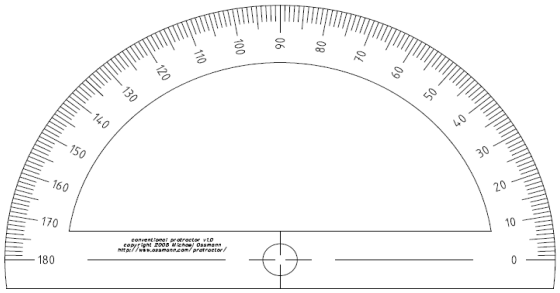
BEHI Field Form - Complete

Location description: Lockeland Springs UT1 R2 BEHI#3 Analysis by: JGS Date: 11/8/2023

Latitude: Longitude:

BEHI category	A		B		C		D		E	
	Bank height	BH score	Root depth	RDH score	Root density	RD score	Surface protection	SP score	Bank angle	BA score
Very low	1.0 – 1.1	1 ○	90 - 100	1 ○	80 - 100	1 ○	80 - 100	1 ○	0 - 20	1 ○
Low	1.1 – 1.2	3 ○	50 - 89	3 ○	55 - 79	3 ○	55 - 79	3 ◉	21 - 60	3 ○
Moderate	1.3 – 1.5	5 ○	30 - 49	5 ◉	30 - 54	5 ◉	30 - 54	5 ○	61 - 80	5 ◉
High	1.6 – 2.0	7 ○	15 - 29	7 ○	15 - 29	7 ○	15 - 29	7 ○	81 - 90	7 ○
Very high	2.1 – 2.8	8.5 ◉	5 - 14	8.5 ○	5 - 14	8.5 ○	10 - 14	8.5 ○	91 - 119	8.5 ○
Extreme	> 2.8	10 ○	< 5	10 ○	< 5	10 ○	< 14	10 ○	> 119	10 ○

Material adjustment (F)			Stratification adjustment (G)		Total Score (Sum A-G)
Bedrock - automatically	Very low	○	No layer	◉ No adjustment	26.5
Boulder - automatically	Low	○	Single layer	○ (+) 5	
Cobble	(-) 10	○	Multiple layers	○ (+) 10	
Gravel or mostly gravel	(+) 5	○			
Sand or mostly sands	(+) 10	○			
Silt/loam	No adjustment	◉			
Clay	(-) 20	○			



BEHI Category: Mod-NBS-Mod

Very low	Low	Moderate	High	Very high	Extreme
≤ 9.5	10 - 19.5	20 - 29.5	30 - 39.5	40 - 45	> 45

Comments:

18' Eroding Right Bank or
Right Bank Armoring 18'

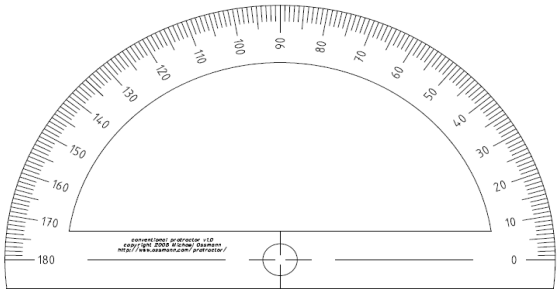
BEHI Field Form - Complete

Location description: Lockeland Springs UT1 R2 BEHI#4 Analysis by: JGS Date: 11/8/2023

Latitude: Longitude:

BEHI category	A		B		C		D		E	
	Bank height	BH score	Root depth	RDH score	Root density	RD score	Surface protection	SP score	Bank angle	BA score
Very low	1.0 – 1.1	1 ○	90 - 100	1 ○	80 - 100	1 ○	80 - 100	1 ◉	0 - 20	1 ○
Low	1.1 – 1.2	3 ○	50 - 89	3 ◉	55 - 79	3 ○	55 - 79	3 ○	21 - 60	3 ◉
Moderate	1.3 – 1.5	5 ○	30 - 49	5 ○	30 - 54	5 ◉	30 - 54	5 ○	61 - 80	5 ○
High	1.6 – 2.0	7 ○	15 - 29	7 ○	15 - 29	7 ○	15 - 29	7 ○	81 - 90	7 ○
Very high	2.1 – 2.8	8.5 ◉	5 - 14	8.5 ○	5 - 14	8.5 ○	10 - 14	8.5 ○	91 - 119	8.5 ○
Extreme	> 2.8	10 ○	< 5	10 ○	< 5	10 ○	< 14	10 ○	> 119	10 ○

Material adjustment (F)			Stratification adjustment (G)		Total Score (Sum A-G)
Bedrock - automatically	Very low	○	No layer	◉ No adjustment	20.5
Boulder - automatically	Low	○	Single layer	○ (+) 5	
Cobble	(-) 10	○	Multiple layers	○ (+) 10	
Gravel or mostly gravel	(+) 5	○			
Sand or mostly sands	(+) 10	○			
Silt/loam	No adjustment	◉			
Clay	(-) 20	○			



BEHI Category: Mod-NBS-Mod

Very low	Low	Moderate	High	Very high	Extreme
≤ 9.5	10 - 19.5	20 - 29.5	30 - 39.5	40 - 45	> 45

Comments:

48' Left Bank Armoring

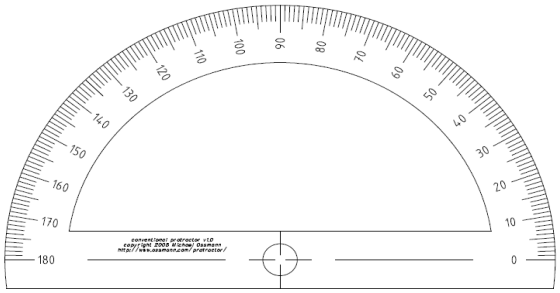
BEHI Field Form - Complete

Location description: Lockeland Springs UT1 R2 BEHI#5 Analysis by: JGS Date: 11/8/2023

Latitude: Longitude:

BEHI category	A		B		C		D		E	
	Bank height	BH score	Root depth	RDH score	Root density	RD score	Surface protection	SP score	Bank angle	BA score
Very low	1.0 – 1.1	1 ○	90 - 100	1 ○	80 - 100	1 ○	80 - 100	1 ○	0 - 20	1 ○
Low	1.1 – 1.2	3 ○	50 - 89	3 ◉	55 - 79	3 ○	55 - 79	3 ○	21 - 60	3 ◉
Moderate	1.3 – 1.5	5 ○	30 - 49	5 ○	30 - 54	5 ◉	30 - 54	5 ◉	61 - 80	5 ○
High	1.6 – 2.0	7 ○	15 - 29	7 ○	15 - 29	7 ○	15 - 29	7 ○	81 - 90	7 ○
Very high	2.1 – 2.8	8.5 ◉	5 - 14	8.5 ○	5 - 14	8.5 ○	10 - 14	8.5 ○	91 - 119	8.5 ○
Extreme	> 2.8	10 ○	< 5	10 ○	< 5	10 ○	< 14	10 ○	> 119	10 ○

Material adjustment (F)			Stratification adjustment (G)		Total Score (Sum A-G)
Bedrock - automatically	Very low	○	No layer	◉ No adjustment	24.5
Boulder - automatically	Low	○	Single layer	○ (+) 5	
Cobble	(-) 10	○	Multiple layers	○ (+) 10	
Gravel or mostly gravel	(+) 5	○			
Sand or mostly sands	(+) 10	○			
Silt/loam	No adjustment	◉			
Clay	(-) 20	○			



BEHI Category: Mod-NBS-Mod

Very low	Low	Moderate	High	Very high	Extreme
≤ 9.5	10 - 19.5	20 - 29.5	30 - 39.5	40 - 45	> 45

Comments:

24' Eroding Right Bank

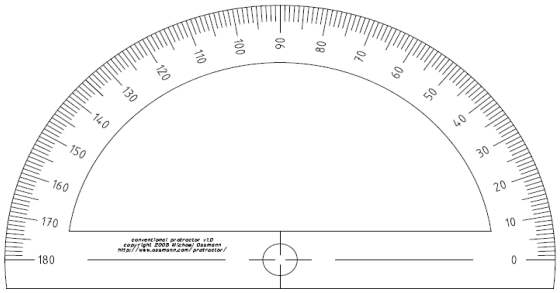
BEHI Field Form - Complete

Location description: Lockeland Springs UT1 R2 BEHI#6 Analysis by: JGS Date: 11/8/2023

Latitude: Longitude:

BEHI category	A		B		C		D		E	
	Bank height	BH score	Root depth	RDH score	Root density	RD score	Surface protection	SP score	Bank angle	BA score
Very low	1.0 – 1.1	1 ○	90 - 100	1 ○	80 - 100	1 ○	80 - 100	1 ○	0 - 20	1 ○
Low	1.1 – 1.2	3 ○	50 - 89	3 ○	55 - 79	3 ○	55 - 79	3 ○	21 - 60	3 ○
Moderate	1.3 – 1.5	5 ○	30 - 49	5 ◉	30 - 54	5 ◉	30 - 54	5 ◉	61 - 80	5 ◉
High	1.6 – 2.0	7 ○	15 - 29	7 ○	15 - 29	7 ○	15 - 29	7 ○	81 - 90	7 ○
Very high	2.1 – 2.8	8.5 ◉	5 - 14	8.5 ○	5 - 14	8.5 ○	10 - 14	8.5 ○	91 - 119	8.5 ○
Extreme	> 2.8	10 ○	< 5	10 ○	< 5	10 ○	< 14	10 ○	> 119	10 ○

Material adjustment (F)			Stratification adjustment (G)		Total Score (Sum A-G)
Bedrock - automatically	Very low	○	No layer	◉ No adjustment	28.5
Boulder - automatically	Low	○	Single layer	○ (+) 5	
Cobble	(-) 10	○	Multiple layers	○ (+) 10	
Gravel or mostly gravel	(+) 5	○			
Sand or mostly sands	(+) 10	○			
Silt/loam	No adjustment	◉			
Clay	(-) 20	○			



BEHI Category: Mod-NBS-Mod

Very low	Low	Moderate	High	Very high	Extreme
≤ 9.5	10 - 19.5	20 - 29.5	30 - 39.5	40 - 45	> 45

Comments:

79' Eroding Left Bank

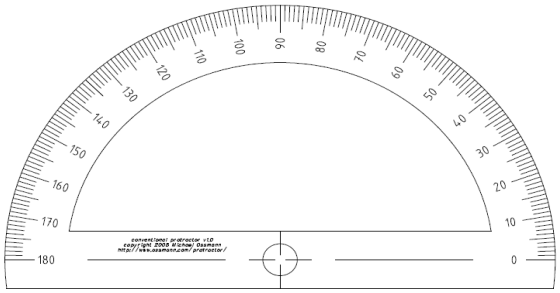
BEHI Field Form - Complete

Location description: Lockeland Springs UT1 R2 BEHI#7 Analysis by: JGS Date: 11/8/2023

Latitude: Longitude:

BEHI category	A		B		C		D		E	
	Bank height	BH score	Root depth	RDH score	Root density	RD score	Surface protection	SP score	Bank angle	BA score
Very low	1.0 – 1.1	1 ○	90 - 100	1 ◉	80 - 100	1 ○	80 - 100	1 ○	0 - 20	1 ○
Low	1.1 – 1.2	3 ○	50 - 89	3 ○	55 - 79	3 ○	55 - 79	3 ○	21 - 60	3 ◉
Moderate	1.3 – 1.5	5 ○	30 - 49	5 ○	30 - 54	5 ○	30 - 54	5 ◉	61 - 80	5 ○
High	1.6 – 2.0	7 ○	15 - 29	7 ○	15 - 29	7 ◉	15 - 29	7 ○	81 - 90	7 ○
Very high	2.1 – 2.8	8.5 ◉	5 - 14	8.5 ○	5 - 14	8.5 ○	10 - 14	8.5 ○	91 - 119	8.5 ○
Extreme	> 2.8	10 ○	< 5	10 ○	< 5	10 ○	< 14	10 ○	> 119	10 ○

Material adjustment (F)			Stratification adjustment (G)		Total Score (Sum A-G)
Bedrock - automatically	Very low	○	No layer	◉ No adjustment	24.5
Boulder - automatically	Low	○	Single layer	○ (+) 5	
Cobble	(-) 10	○	Multiple layers	○ (+) 10	
Gravel or mostly gravel	(+) 5	○			
Sand or mostly sands	(+) 10	○			
Silt/loam	No adjustment	◉			
Clay	(-) 20	○			



BEHI Category: Mod-NBS-Mod

Very low	Low	Moderate	High	Very high	Extreme
≤ 9.5	10 - 19.5	20 - 29.5	30 - 39.5	40 - 45	> 45

Comments:

64' Eroding Left Bank

LWD Field Form

Investigator(s)	Josh Sitz	State	TN	Survey Length	328 ft.
Date	11/8/2023	County	Davidson	Bkf Width	12.1
Stream Name	UT1	Latitude (dd)		Bkf Mean Depth	1.2
Reach ID	Reach 2	Longitude (dd)			
Field Notes:	No wood found.				

SCORE										
	1		2		3		4		5		
CATEGORY	*** PIECES ***										**PIECE SCORES**
Length/BKF Width	0 to 0.4		0.4 to 0.6		0.6 to 0.8		0.8 to 1.0		> 1.0		0
Diameter (cm)	10 to 20		20 to 30		30 to 40		40 to 50		>50		0
Location	Zone 4 (Above BKF/Extending into Channel)				Zone 3 (Above BKF/Within Streambanks)		Zone 2 (Above WS/Below BKF)		Zone 1 (Below WS)		0
Type	Bridge				Ramp		Submersed		Buried		0
Structure	Plain		Plain/Int		Intermediate		Int/Sticky		Sticky		0
Stability	Moveable		Mov/Int		Intermediate		Int/Sec		Secured		0
Orientation (deg)	0 to 20		20 to 40		40 to 60		60 to 80		80 to 90		0
CATEGORY	**** DEBRIS DAMS ****										**DAM SCORES**
Length (% of BKF Width)	0 to 20		20 to 40		40 to 60		60 to 80		80 to 100		0
Height (% of BKF Depth)	0 to 20		20 to 40		40 to 60		60 to 80		80 to 100		0
Structure	Coarse		Coarse/Int		Intermediate		Int/Fine		Fine		0
Location	Partially high flow		In high flow		Partially low flow		Mid low flow		In low flow		0
Stability	Moveable		Mov/Int		Intermediate		Int/Sec		Secured		0

* Pieces - Non-living wood that has a large end diameter a 10 cm and has a length a 1 m. " Debris Dams - Three (3) or more pieces touching.

LWDI SCORE	**0**

Plot Data: CVS Level 3

General Information

Project Number:

Project Name: Lockeland Springs PRM

Team: KCI Technologies

Plot: UT1 Reach 2 LB

Start Date: 29/ Nov/2023

Party	Role**
Josh Sitz	Plot Leader

**Roles: Co-leader, Assistant, Guide, Land owner, Taxonomist, Other

Soil Drainage*

- ☐ Excessively drained
- ☐ Somewhat excessively
- ☐ Well drained
- ☑ Moderately well d.
- ☐ Somewhat poorly d.
- ☐ Poorly drained
- ☐ Very poorly drained

Salinity*

- ☐ Saltwater
- ☐ Brackish
- ☑ Fresh
- ☐ Upland (n/a)

Soil Series / Type:

Soil Series Source:

Soil Texture*:

Rock Type*:

Surficial Deposits*:

Soil Descr.:

Location

General: Nashville

State: TN County: Davidson

Quadrangle:

Place Names: 1)

2) 3)

EEP Reach:

Land Owner:

Source of coordinates: GPS (map, GPS, survey)

GPS location in plot (meters): x= 0 y= 0

Coordinate System: ☑ Lat/Long ☐ UTM ☐ State Plane ☐ Other (*specify*): _____

Coord. Units: ☑ deg. ☐ deg. min. ☐ m ☐ ft ☐ _____

Datum: ☐ NAD83/WGS84 ☐ NAD27

Zone: (if applicable)

Lat: 36.172311 **(or Northing)**

Long: -86.730858 **(or Easting)**

Coordinate Accuracy (m radius): 1m

GPS File Name:

Site Characteristics

Elevation: ± ☐m ☐ft

Slope (degrees):

Aspect (degrees):

Compass Type: ☐ magnetic ☐ true

Classification* Fit: excellent, good, fair, poor; Conf: high, med, low

Provisional comm._____

Comm.(1)_____Fit=__Conf=__

Comm.(2)_____Fit=__Conf=__

Classifier _____ Date ___/___/___

Taxonomic Standard Used for Plants

Authority: ITIS, **Publ. Date:** 11/8/17

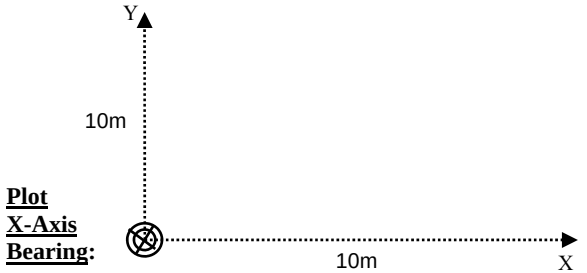
Plot Placement:

(check 1 or more)

- ☑ Representative
- ☐ Random
- ☐ Stratified
- ☐ Transect component
- ☐ Systematic (grid)
- ☐ Capture specific feature

Plot Diagram:

Draw plot boundaries and show location of any landmarks and objects in the key below. Also indicate X and Y dimensions of plot, in meters.



●Posts (x,y) (meters)
(0 , 0)
(10, 0)
(10 , 10)
(0 , 10)
(,)
(,)

Key: ◎ Plot origin (0,0) point ⊗ GPS location point → Photo taken, with direction ● Location of posts

Plot Size (ares): 1

→ Photo Identifier(s):

Topographic Position*

- ☐ Interfluve (crest, summit, ridge)
- ☐ High slope (shoulder, upper, convex)
- ☐ High level
- ☐ Midslope
- ☐ Backslope (cliff)
- ☐ Step in slope
- ☐ Lowslope (lower, foot, colluvial)
- ☐ Toeslope
- ☐ Low level (terrace)
- ☐ Channel wall (bank)
- ☐ Channel bed (valley bottom)
- ☐ Basin floor (depression)
- ☐ *Other:* _____

Cover by Strata

Canopy Height (m):

Strata	Height Range (ft)	Total Cover (%)
Tree	X	0%
Shrub	X	0%
Herb	X	100%
(**F**loating)	-	
(**A**quatic Submerged)	-	

Height defaults listed, but can be edited if other values better suit vegetation.

Hydrologic Regime*

- ☐ Upland (seldom flooded)
- ☐ Intermittently/seasonally saturated (seldom flooded)
- ☐ Permanently/ semipermanently saturated (dry < 1 / yr, seldom flooded)
- ☐ Occasionally flooded (<1 / yr)
- ☐ Temporarily flooded
- ☐ Intermittently flooded
- ☐ Semipermanently flooded
- ☐ Permanently flooded
- ☐ Tidally flooded - daily
- ☐ Tidally flooded - monthly
- ☐ Tidally flooded - irregular (wind, storms)
- ☐ Unknown

Water

Percent of Plot Submerged: 0 %

Mean Water Depth Now: 0 cm

Closest Dist. to Shore: 0 m

Landform Type*:

Notes

If more space is needed, check the box and use back of datasheets

Date plot was last planted (MM/YYYY): (baseline or if since last monitoring)

Layout: (anything unusual about plot layout and shape) ☐ more...

Plot Location: (directions to plot, landscape content) ☐ more...

Plot Rationale: (why location was chosen for the plot) ☐ more...

Vegetation: (characterization of community, dominants, and principle strata) ☐ more...

Natural Woody Stem Data: CVS Levels 2 - 3

Team: KCI Leader: JS Project: Lockeland Springs PRM Plot: UT1 R2 LB Date: 11/29/2023 Area (=100m²): 1

Species Name		Seedlings - Height Class			Saplings - DBH										
Common Name	**Scientific Name**	10-50cm 3.9-19.7in	50-100cm 19.7-39.4in	100-137cm 39.4-53.9in	0-1cm 0-0.4in	1-2.5cm 0.4-1.0in	2.5-5cm 1.0-2.0in	5-10cm 2.0-3.9in	10-15cm 3.9-5.9in	15-20cm 5.9-7.9in	20-25cm 7.9-9.8in	25-30cm 9.8-11.8in	30-35cm 11.8-13.8in	35-40cm 13.8-15.7in	>40cm >15.7in
	None														
Total		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Average DBH by Class (cm)					#DIV/0!		#DIV/0!								
Average DBH (inches)					**#DIV/0!**										
Stem Density					**0.0**										

Team: KCI Leader: JS Project: Lockeland Springs PRM Plot: UT1 R2 LB VP Date: 11/29/2023 Ares (=100m²): 1

Strata					Species Name		Invasive	Modules		
T	S	H	(F)	(A)	Common Name	Scientific Name				
		5			multiflora Rose	*#N/A*	YES			
		4			broomsedge	*Andropogon virginicus*	NO			
		4			wingstem	*Verbesina alternifolia*	NO			
		3			tall fescue	*Lolium arundinaceum*	NO			
		5			aster	*Aster spp.*	NO			
		5			curly dock	*Rumex crispus*	NO			
		8			mixed grasses		NO			

Cover: trace=1; 0-1%=2; 1-2%=3; 2-5%=4; 5-10%=5; 10-25%=6; 25-50%=7; 50-75%=8; 75-95%=9; 95-100%=*

Plot Data: CVS Level 3

General Information

Project Number:

Project Name: Lockeland Springs PRM

Team: KCI Technologies

Plot: UT1 Reach 2 RB

Start Date: 29/ Nov/2023

Party	Role**
Josh Sitz	Plot Leader

**Roles: Co-leader, Assistant, Guide, Land owner, Taxonomist, Other

Soil Drainage*

- ☐ Excessively drained
- ☐ Somewhat excessively
- ☐ Well drained
- ☑ Moderately well d.
- ☐ Somewhat poorly d.
- ☐ Poorly drained
- ☐ Very poorly drained

Salinity*

- ☐ Saltwater
- ☐ Brackish
- ☑ Fresh
- ☐ Upland (n/a)

Soil Series / Type:

Soil Series Source:

Soil Texture*:

Rock Type*:

Surficial Deposits*:

Soil Descr.:

Location

General: Nashville

State: TN CountyDavidson

Quadrangle:

Place Names: 1)

2) 3)

EEP Reach:

Land Owner:

Source of coordinates: GPS (map, GPS, survey)

GPS location in plot (meters): x= 0 y= 0

Coordinate System: ☑ Lat/Long ☐ UTM ☐ State Plane ☐ Other (*specify*): _____

Coord. Units: ☑ deg. ☐ deg. min. ☐ m ☐ ft ☐ _____

Datum: ☒ NAD83/WGS84 ☐ NAD27

Zone: (if applicable)

Lat: 36.172463 **(or Northing)**

Long: -86.731161 **(or Easting)**

Coordinate Accuracy (m radius): 1m

GPS File Name:

Site Characteristics

Elevation: ± ☐m ☐ft

Slope (degrees):

Aspect (degrees):

Compass Type: ☐ magnetic ☐ true

Classification*

Fit:excellent,good, fair, poor; Conf: high, med, low

Provisional comm._____

Comm.(1)_____Fit=__Conf=__

Comm.(2)_____Fit=__Conf=__

Classifier _____ Date ___/___/___

Taxonomic Standard Used for Plants

Authority: ITIS, **Publ. Date:** 11/8/17

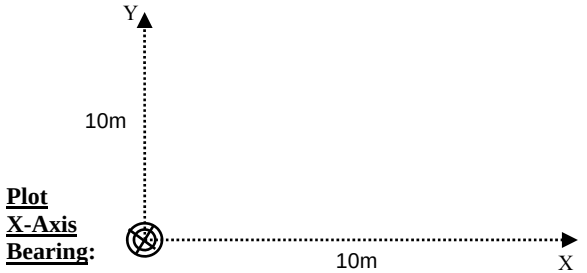
Plot Placement:

(check 1 or more)

- ☑ Representative
- ☐ Random
- ☐ Stratified
- ☐ Transect component
- ☐ Systematic (grid)
- ☐ Capture specific feature

Plot Diagram:

Draw plot boundaries and show location of any landmarks and objects in the key below. Also indicate X and Y dimensions of plot, in meters.



●Posts (x,y) (meters)
(0 , 0)
(10, 0)
(10 , 10)
(0 , 10)
(,)
(,)

Key: ◎ Plot origin (0,0) point ⊗ GPS location point → Photo taken, with direction ● Location of posts

Plot Size (ares): 1

→ Photo Identifier(s):

Topographic Position*

- ☐ Interfluve (crest, summit, ridge)
- ☐ High slope (shoulder, upper, convex)
- ☐ High level
- ☐ Midslope
- ☐ Backslope (cliff)
- ☐ Step in slope
- ☐ Lowslope (lower, foot, colluvial)
- ☐ Toeslope
- ☐ Low level (terrace)
- ☐ Channel wall (bank)
- ☐ Channel bed (valley bottom)
- ☐ Basin floor (depression)
- ☐ *Other:* _____

Cover by Strata

Canopy Height (m):

Strata	Height Range (ft)	Total Cover (%)
Tree	X	0%
Shrub	X	0%
Herb	X	100%
(**F**loating)	-	
(**A**quatic Submerged)	-	

Height defaults listed, but can be edited if other values better suit vegetation.

Hydrologic Regime*

- ☐ Upland (seldom flooded)
- ☐ Intermittently/seasonally saturated (seldom flooded)
- ☐ Permanently/ semipermanently saturated (dry < 1 / yr, seldom flooded)
- ☐ Occasionally flooded (<1 / yr)
- ☐ Temporarily flooded
- ☐ Intermittently flooded
- ☐ Semipermanently flooded
- ☐ Permanently flooded
- ☐ Tidally flooded - daily
- ☐ Tidally flooded - monthly
- ☐ Tidally flooded - irregular (wind, storms)
- ☐ Unknown

Water

Percent of Plot Submerged: 0 %

Mean Water Depth Now: 0 cm

Closest Dist. to Shore: 0 m

Landform Type*:

Notes

If more space is needed, check the box and use back of datasheets

Date plot was last planted (MM/YYYY): (baseline or if since last monitoring)

Layout: (anything unusual about plot layout and shape) ☐ more...

Plot Location: (directions to plot, landscape content) ☐ more...

Plot Rationale: (why location was chosen for the plot) ☐ more...

Vegetation: (characterization of community, dominants, and principle strata) ☐ more...

Natural Woody Stem Data: CVS Levels 2 - 3

Team: KCI   Leader: JS   Project: Lockeland Springs PRM   Plot: UT1 R2 RB Date: 11/8/2023   Area (=100m²): 1

Species Name		**Seedlings - Height Class**			**Saplings - DBH**												
Common Name	**Scientific Name**	10-50cm 3.9-19.7in	50-100cm 19.7-39.4in	100-137cm 39.4-53.9in	0-1cm 0-0.4in	1-2.5cm 0.4-1.0in	2.5-5cm 1.0-2.0in	5-10cm 2.0-3.9in	10-15cm 3.9-5.9in	15-20cm 5.9-7.9in	20-25cm 7.9-9.8in	25-30cm 9.8-11.8in	30-35cm 11.8-13.8in	35-40cm 13.8-15.7in	>40cm >15.7in
	None																
Total		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Average DBH by Class (cm)					#DIV/0!		#DIV/0!								
Average DBH (inches)					**#DIV/0!**										
Stem Density					**0.0**										

Team: KCI Leader: JS Project: Lockeland Springs PRM Plot: UT1 R2 RB Date: 11/08/2023 Ares (=100m²): 1

Strata					Species Name		Invasive	Modules		
T	S	H	(F)	(A)	Common Name	Scientific Name				
		4			tall fescue	*Lolium arundinaceum*	NO			
		4			common blue violet	*Viola sororia*	NO			
		4			aster	*Aster spp.*	NO			
		7			bearded beggarticks	*Bidens aristosa*	NO			
		7			Mixed Grasses					

Cover: trace=1; 0-1%=2; 1-2%=3; 2-5%=4; 5-10%=5; 10-25%=6; 25-50%=7; 50-75%=8; 75-95%=9; 95-100%=*

Date:
Investigators:

TN SQT and Debit Tool Rapid Assessment Form

Version 1.2 January 2020

I. Reach Information and Stratification

Project Name:	Loackeland Springs
Reach ID:	UT2
Upstream Latitude:	36.172057
Upstream Longitude:	-86.731001
Downstream Latitude:	36.172047
Downstream Longitude:	-86.731631
Ecoregion:	71h
Drainage Area (sq. mi.):	0.06
Stream Reach Length (ft):	201.63
Flow Type:	Perennial/Intermittent
Valley Type:	Unconfined Alluvial

Shading Key
Desktop Value
Field Value
Calculation

II. Reach Walk

A.

Length of Armoring on banks (ft)							
Total (ft)							
Percent Armoring (%)							

B.

Difference between BKF stage and WS (ft)	Describe the bankfull indicator
N/A	Channel dry during initial survey

Date:
Investigators:

TN SQT and Debit Tool Rapid Assessment Form

Version 1.2 January 2020

III. Bankfull Verification and Stable Riffle Cross Section

A.	Difference between BKF stage and WS (ft) *Average or consensus value from reach walk.*	N/A
B.	Bankfull Width (ft)	3.3
C.	Bankfull Mean Depth (ft) = Average of depth measurements	0.4
D.	Bankfull Area (sq. ft.) Width * Mean Depth	1.4
E.	Regional Curve Bankfull Width (ft)	7.4
F.	Regional Curve Bankfull Mean Depth (ft)	0.5
G.	Regional Curve Bankfull Area (sq. ft.)	3.8
H.	Curve Used	71h

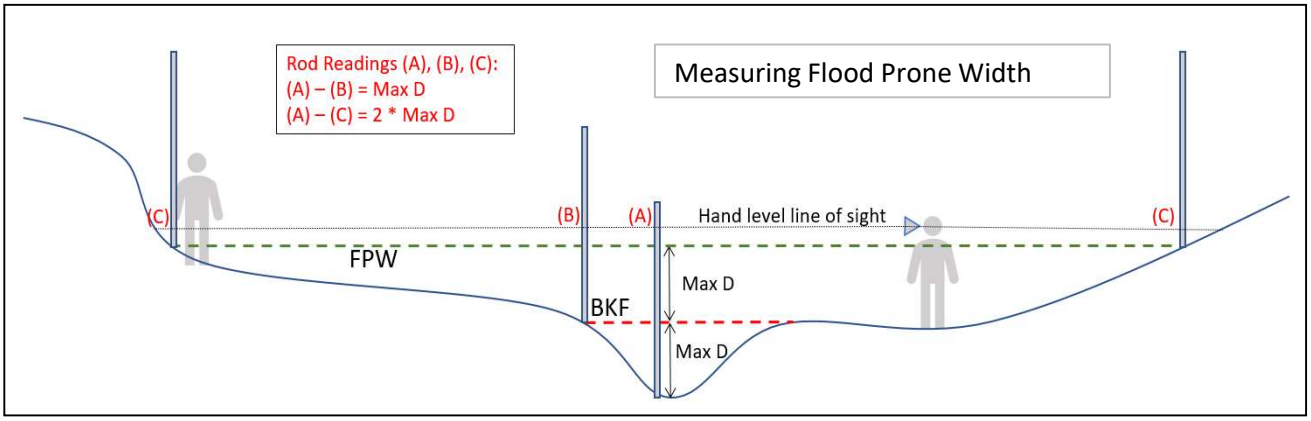
I.	Flood Prone Width (FPW; ft)	39.8
J.	Entrenchment Ratio (ER)	12.2
K.	Width Depth Ratio (WDR)	7.8
L.	Stream Type	E4b

Cross Section Measurements
Depth measured from bankfull

Station	Depth	Station	Depth
15.7281	0		
15.8815	0.256		
16.5943	0.4		
17.1628	0.613		
18.2122	0.533		
18.646	0.284		
19.1542	0		

Quick Rosgen Stream Classification Guide (Rosgen, 1996)				
ER < 1.4		1.4 < ER < 2.2	ER > 2.2	
WDR < 12	WDR > 12	WDR > 12	WDR < 12	WDR > 12
A or G	F	B	E	C

Rosgen, D.L., 1996. Applied River Morphology, Wildland Hydrology Books, Pagosa Springs, Colorado.



Date:
Investigators:

TN SQT and Debit Tool Rapid Assessment Form

Version 1.2 January 2020

IV. Riffle Data (Floodplain Connectivity & Bed Form Diversity)

A.

Assessment Segment Length At least 20 x the Bankfull Width	178.57		20*Bankfull Width	65.5

B. Bank Height & Riffle Data

	R1	R2	R3	R4	R5	R6	R7	R8
Begin Station (Distance along tape)	0	13.7	28.6	54.3	103.5			
End Station (Distance along tape)	2.4	15.0	48.5	96.0	178.6			
Low Bank Height (ft)	0.3	0.5	0.5	0.6	0.9			
Bankfull Max Depth (ft)	0.3	0.5	0.5	0.6	0.9			
Bankfull Width (ft)	3.3	3.3	3.3	3.3	4.1			
Flood Prone Width (ft)	39.0	39.8	38.7	39.8	45.6			
Bankfull Mean Depth (ft)	0.4	0.4	0.4	0.4	0.7			
Riffle Length (ft) *Including Run*	2.4	1.3	19.9	41.7	75.0			
Bank Height Ratio (BHR) Low Bank H / BKF Max D	1.0	1.0	1.0	1.0	1.0			
BHR * Riffle Length (ft)	2.4	1.3	19.9	41.7	75.0			
Entrenchment Ratio (ER)	11.9	12.2	11.8	12.2	11.1			
ER * Riffle Length (ft)	28.8	15.2	235.1	507.1	834.5			
WDR BKF Width / BKF Mean D	7.8	7.8	7.8	7.8	5.9			

Date:
Investigators:

TN SQT and Debit Tool Rapid Assessment Form

Version 1.2 January 2020

IV. Riffle Data (Continued)

C.	Total Riffle Length (ft)	140.3
D.	**Weighted BHR** $\frac{\Sigma(Bank\ Height\ Ratio_i \times \text{Riffle Length}_i)}{\Sigma Riffle\ Length}$	1.0
E.	**Weighted ER**	11.6
F.	**Maximum WDR**	7.8
G.	**Percent Riffle (%)**	79%

V. Slope

A.

	Begin	End	Difference	Slope (ft/ft)
Station along tape (ft)	0	178.6	178.6	0.032
Stadia Rod Reading (ft)	101.7	95.9	5.8	

VI. Stream Type Classification

		Assessment Segment
A.	Entrenchment Ratio (ft/ft)	12.2
B.	Width Depth Ratio (ft/ft)	7.8
C.	Channel Material Estimate	Gravel
D.	Stream Type (Rosgen, 1996)	E4b

VII. Pool Data (Bed Form Diversity)

A.

	P1	P2	P3	P4	P5	P6	P7	P8
Geomorphic Pool?	G			G				
Station At maximum pool depth	8.4	16.7	49.7	99.4				
P-P Spacing (ft)	X			91.1				
Pool Spacing Ratio Pool Spacing / BKF Width	X			27.8				
Pool Depth (ft) Measured from Bankfull	0.6	0.4	0.8	0.2				
Pool Depth Ratio Pool depth/BKF mean D	1.3	1.0	1.8	0.5				

B.	Average Pool Depth Ratio	1.2	C.	Median Pool Spacing Ratio	27.8

Date:
Investigators:

TN SQT and Debit Tool Rapid Assessment Form

Version 1.2 January 2020

VIII. Large Woody Debris

A.	Number of Pieces per 100m	0

IX. Lateral Migration

A. Bank Data

BEHI/NBS Score	Bank Length (ft)	BEHI/NBS Score	Bank Length (ft)
15 (L)/M	6	11 (L)/M	8
21 (M)/M	8	23 (M)/M	6
25 (M)/M	7	27 (M)/M	11
23 (M)/M	6	29 (M)/H	7
23 (M)/L	5	29 (M)/L	22
21 (M)/H	6		

B.	Dominant BEHI/NBS Score	M/M
C.	Total Eroding Bank Length (ft)	80
D.	Total Bank Length (ft)	357.1
E.	Percent Streambank Erosion (%) Total Eroding Bank Length/ Total Bank Length	22%

X. Riparian Vegetation

A.

Buffer Width	Buffer Width Measurements (ft)							Avg.
	1	2	3	4	5	6	7	
Left (looking downstream)	121							121.0
Right (looking downstream)	98							98.0

XI. Sinuosity

A.	Stream Length (ft)	208.2
B.	Valley Length (ft)	201.6
C.	Sinuosity	1.03

Date:
Investigators:

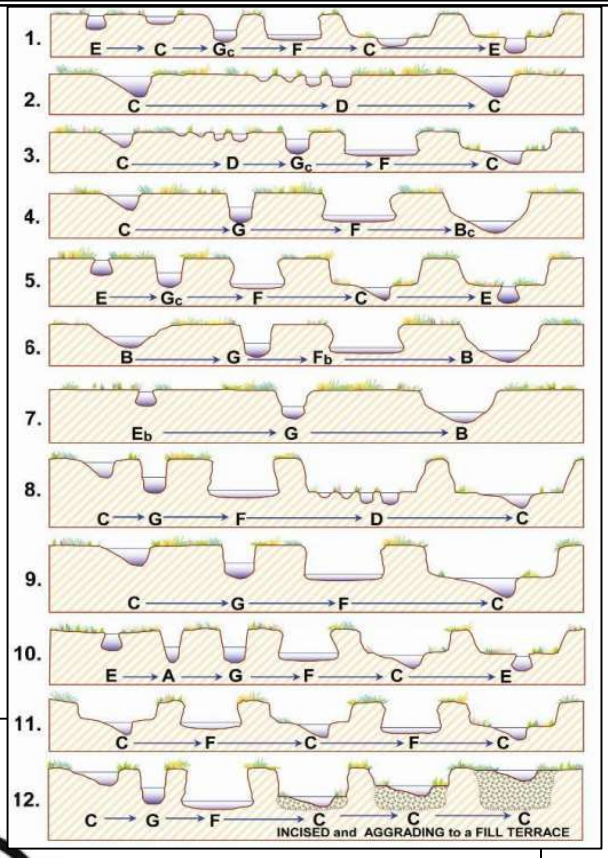
TN SQT and Debit Tool Rapid Assessment Form

Version 1.2 January 2020

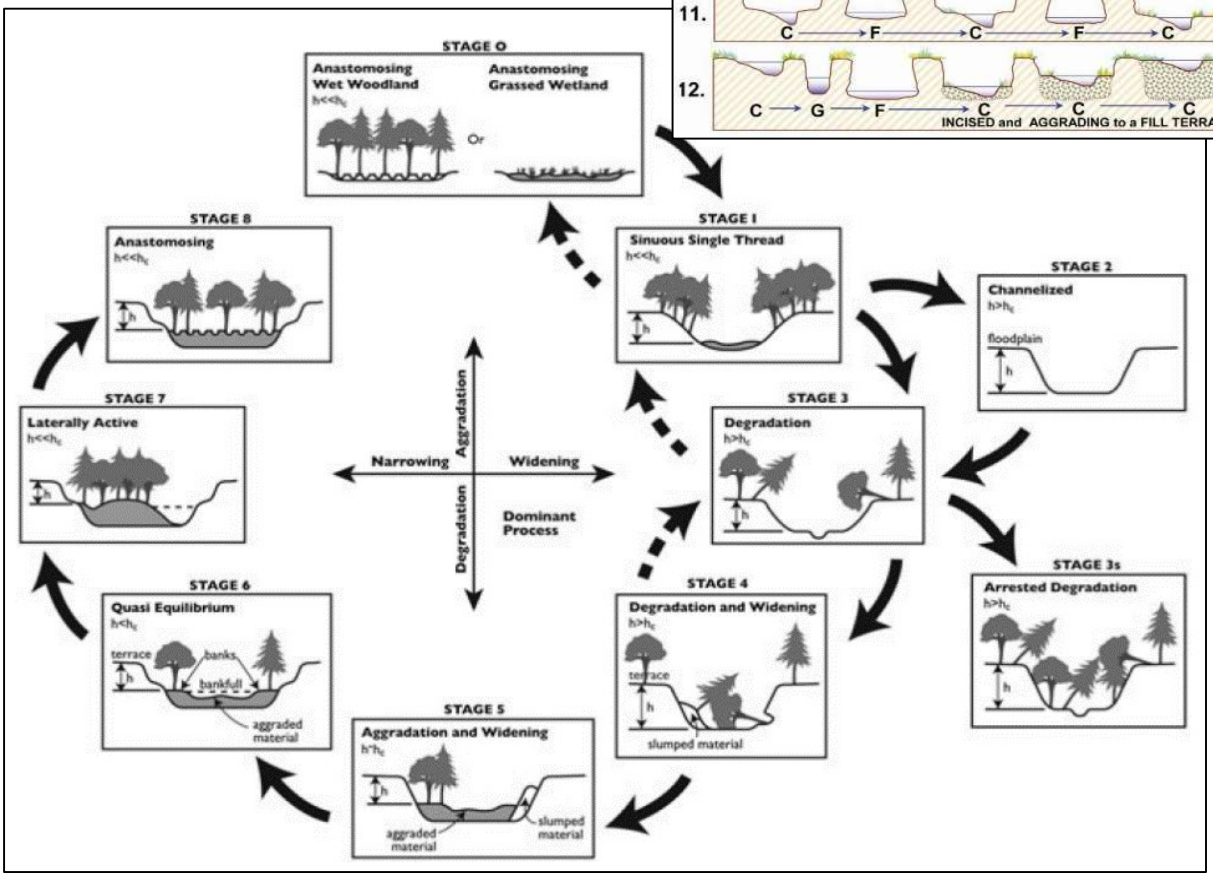
XII. Channel Evolution

A.	Rosgen Channel Type Succession	1
	Simon Channel Evolution Model (Stage)	3

Rosgen Channel Type

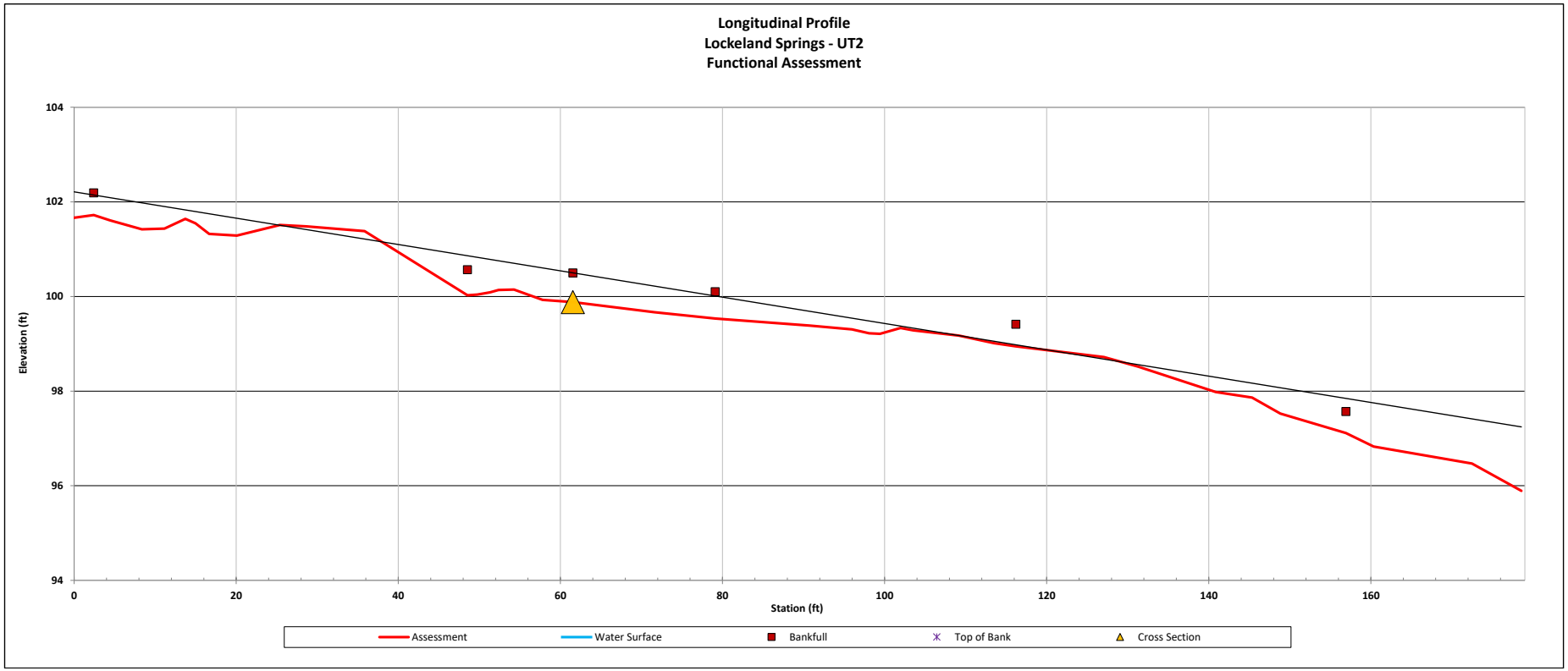


Stream Evolution Model



1 *Figure 7-48, Watershed Assessment of River Stability and Sediment Supply (WARSSS),* by David L. Rosgen, Wildland Hydrology, 2009, p. 7-175.

2 B. Cluer, C. Thorne. "A Stream Evolution Model Integrating Habitat and Ecosystem Benefits." *River Research and Applications.* 2013.

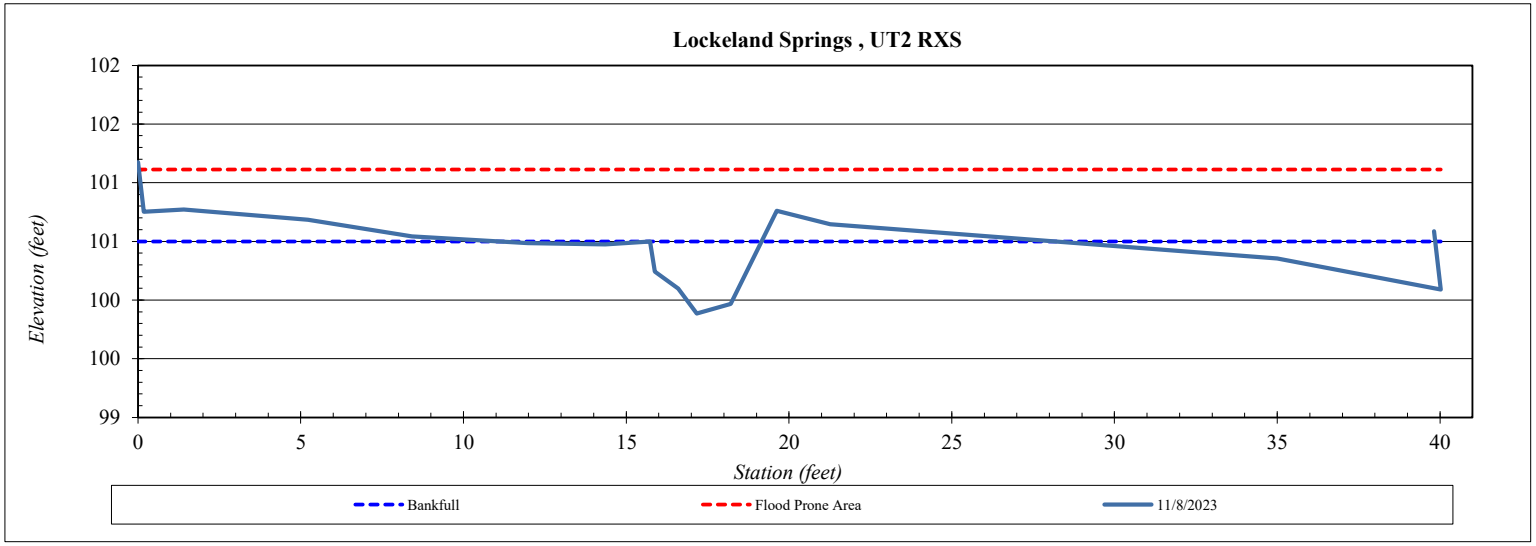

Longitudinal Profile
Lockeland Springs - UT2
Functional Assessment
Elevation (ft)
104
102
100
98
96
94
0
20
40
60
80
100
120
140
160
Station (ft)
Assessment
Water Surface
Bankfull
Top of Bank
Cross Section

Cross-Section Plots

River Basin:	Lower Cumberland-Sycamore
Site:	Lockeland Springs
XS ID	UT2 RXS
Drainage Area (sq mi):	0.06
Date:	11/8/2023
Field Crew:	J. Sitz, T. Guess, E. White

Station	Elevation
0.00	101.18
0.17	100.75
1.40	100.77
5.22	100.68
8.42	100.54
11.97	100.49
14.35	100.47
15.73	100.50
15.88	100.24
16.59	100.10
17.11	100.10
17.16	99.89
18.21	99.97
18.65	100.22
19.62	100.76
21.26	100.65
35.00	100.36
40.02	100.09
39.81	100.59

SUMMARY DATA	
Bankfull Elevation:	100.50
Bankfull Cross-Sectional Area:	1.4
Bankfull Width:	3.3
Flood Prone Area Elevation:	101.1
Flood Prone Width:	39.8
Max Depth at Bankfull:	0.6
Mean Depth at Bankfull:	0.4
W / D Ratio:	7.8
Entrenchment Ratio:	12.2
Bank Height Ratio:	1.0



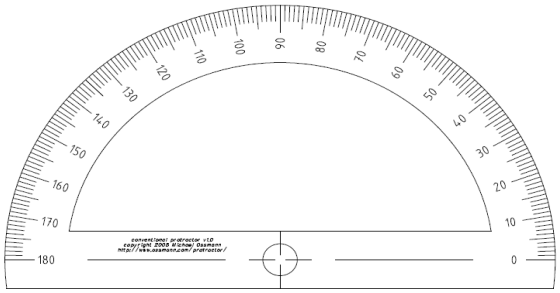
BEHI Field Form - Complete

Location description: Lockeland Springs UT2 BEHI#1 Analysis by: JGS Date: 11/8/2023

Latitude: Longitude:

BEHI category	A		B		C		D		E	
	Bank height	BH score	Root depth	RDH score	Root density	RD score	Surface protection	SP score	Bank angle	BA score
Very low	1.0 – 1.1	1 ◉	90 - 100	1 ◉	80 - 100	1 ○	80 - 100	1 ○	0 - 20	1 ○
Low	1.1 – 1.2	3 ○	50 - 89	3 ○	55 - 79	3 ◉	55 - 79	3 ○	21 - 60	3 ○
Moderate	1.3 – 1.5	5 ○	30 - 49	5 ○	30 - 54	5 ○	30 - 54	5 ◉	61 - 80	5 ◉
High	1.6 – 2.0	7 ○	15 - 29	7 ○	15 - 29	7 ○	15 - 29	7 ○	81 - 90	7 ○
Very high	2.1 – 2.8	8.5 ○	5 - 14	8.5 ○	5 - 14	8.5 ○	10 - 14	8.5 ○	91 - 119	8.5 ○
Extreme	> 2.8	10 ○	< 5	10 ○	< 5	10 ○	< 14	10 ○	> 119	10 ○

Material adjustment (F)			Stratification adjustment (G)		Total Score (Sum A-G)
Bedrock - automatically	Very low	○	No layer	◉ No adjustment	15
Boulder - automatically	Low	○	Single layer	○ (+) 5	
Cobble	(-) 10	○	Multiple layers	○ (+) 10	
Gravel or mostly gravel	(+) 5	○			
Sand or mostly sands	(+) 10	○			
Silt/loam	No adjustment	◉			
Clay	(-) 20	○			



BEHI Category: Low-NBS-Mod

Very low	Low	Moderate	High	Very high	Extreme
≤ 9.5	10 - 19.5	20 - 29.5	30 - 39.5	40 - 45	> 45

Comments:

Stable

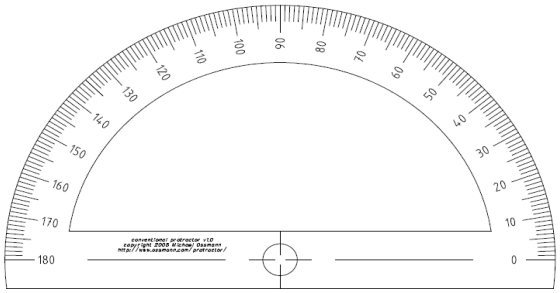
BEHI Field Form - Complete

Location description: Lockeland Springs UT2 BEHI#2 Analysis by: JGS Date: 11/8/2023

Latitude: Longitude:

BEHI category	A		B		C		D		E	
	Bank height	BH score	Root depth	RDH score	Root density	RD score	Surface protection	SP score	Bank angle	BA score
Very low	1.0 – 1.1	1 ○	90 - 100	1 ○	80 - 100	1 ○	80 - 100	1 ○	0 - 20	1 ○
Low	1.1 – 1.2	3 ◉	50 - 89	3 ◉	55 - 79	3 ○	55 - 79	3 ○	21 - 60	3 ○
Moderate	1.3 – 1.5	5 ○	30 - 49	5 ○	30 - 54	5 ◉	30 - 54	5 ◉	61 - 80	5 ◉
High	1.6 – 2.0	7 ○	15 - 29	7 ○	15 - 29	7 ○	15 - 29	7 ○	81 - 90	7 ○
Very high	2.1 – 2.8	8.5 ○	5 - 14	8.5 ○	5 - 14	8.5 ○	10 - 14	8.5 ○	91 - 119	8.5 ○
Extreme	> 2.8	10 ○	< 5	10 ○	< 5	10 ○	< 14	10 ○	> 119	10 ○

Material adjustment (F)			Stratification adjustment (G)		Total Score (Sum A-G)
Bedrock - automatically	Very low	○	No layer	◉ No adjustment	21
Boulder - automatically	Low	○	Single layer	○ (+) 5	
Cobble	(-) 10	○	Multiple layers	○ (+) 10	
Gravel or mostly gravel	(+) 5	○			
Sand or mostly sands	(+) 10	○			
Silt/loam	No adjustment	◉			
Clay	(-) 20	○			



BEHI Category: Mod-NBS-Mod

Very low	Low	Moderate	High	Very high	Extreme
≤ 9.5	10 - 19.5	20 - 29.5	30 - 39.5	40 - 45	> 45

Comments:

Eroding 8'

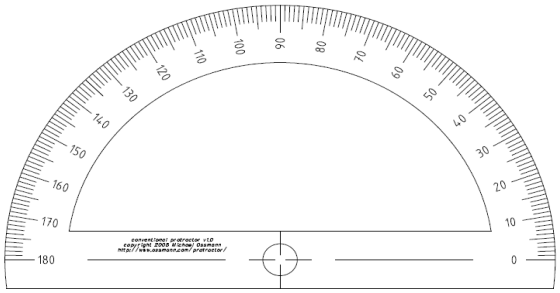
BEHI Field Form - Complete

Location description: Lockeland Springs UT2 BEHI#3 Analysis by: JGS Date: 11/8/2023

Latitude: Longitude:

BEHI category	A		B		C		D		E	
	Bank height	BH score	Root depth	RDH score	Root density	RD score	Surface protection	SP score	Bank angle	BA score
Very low	1.0 – 1.1	1 ○	90 - 100	1 ○	80 - 100	1 ○	80 - 100	1 ○	0 - 20	1 ○
Low	1.1 – 1.2	3 ◉	50 - 89	3 ◉	55 - 79	3 ○	55 - 79	3 ○	21 - 60	3 ○
Moderate	1.3 – 1.5	5 ○	30 - 49	5 ○	30 - 54	5 ○	30 - 54	5 ◉	61 - 80	5 ○
High	1.6 – 2.0	7 ○	15 - 29	7 ○	15 - 29	7 ◉	15 - 29	7 ○	81 - 90	7 ◉
Very high	2.1 – 2.8	8.5 ○	5 - 14	8.5 ○	5 - 14	8.5 ○	10 - 14	8.5 ○	91 - 119	8.5 ○
Extreme	> 2.8	10 ○	< 5	10 ○	< 5	10 ○	< 14	10 ○	> 119	10 ○

Material adjustment (F)			Stratification adjustment (G)		Total Score (Sum A-G)
Bedrock - automatically	Very low	○	No layer	◉ No adjustment	25
Boulder - automatically	Low	○	Single layer	○ (+) 5	
Cobble	(-) 10	○	Multiple layers	○ (+) 10	
Gravel or mostly gravel	(+) 5	○			
Sand or mostly sands	(+) 10	○			
Silt/loam	No adjustment	◉			
Clay	(-) 20	○			



BEHI Category: Mod-NBS-High

Very low	Low	Moderate	High	Very high	Extreme
≤ 9.5	10 - 19.5	20 - 29.5	30 - 39.5	40 - 45	> 45

Comments:

Eroding 7'

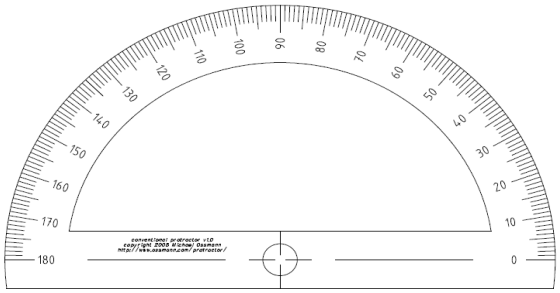
BEHI Field Form - Complete

Location description: Lockeland Springs UT2 BEHI#4 Analysis by: JGS Date: 11/8/2023

Latitude: Longitude:

BEHI category	A		B		C		D		E	
	Bank height	BH score	Root depth	RDH score	Root density	RD score	Surface protection	SP score	Bank angle	BA score
Very low	1.0 – 1.1	1 ○	90 - 100	1 ○	80 - 100	1 ○	80 - 100	1 ○	0 - 20	1 ○
Low	1.1 – 1.2	3 ◉	50 - 89	3 ◉	55 - 79	3 ○	55 - 79	3 ○	21 - 60	3 ○
Moderate	1.3 – 1.5	5 ○	30 - 49	5 ○	30 - 54	5 ◉	30 - 54	5 ◉	61 - 80	5 ○
High	1.6 – 2.0	7 ○	15 - 29	7 ○	15 - 29	7 ○	15 - 29	7 ○	81 - 90	7 ◉
Very high	2.1 – 2.8	8.5 ○	5 - 14	8.5 ○	5 - 14	8.5 ○	10 - 14	8.5 ○	91 - 119	8.5 ○
Extreme	> 2.8	10 ○	< 5	10 ○	< 5	10 ○	< 14	10 ○	> 119	10 ○

Material adjustment (F)			Stratification adjustment (G)		Total Score (Sum A-G)
Bedrock - automatically	Very low	○	No layer	◉ No adjustment	23
Boulder - automatically	Low	○	Single layer	○ (+) 5	
Cobble	(-) 10	○	Multiple layers	○ (+) 10	
Gravel or mostly gravel	(+) 5	○			
Sand or mostly sands	(+) 10	○			
Silt/loam	No adjustment	◉			
Clay	(-) 20	○			



BEHI Category: Mod-NBS-Mod

Very low	Low	Moderate	High	Very high	Extreme
≤ 9.5	10 - 19.5	20 - 29.5	30 - 39.5	40 - 45	> 45

Comments:

Eroding 6'

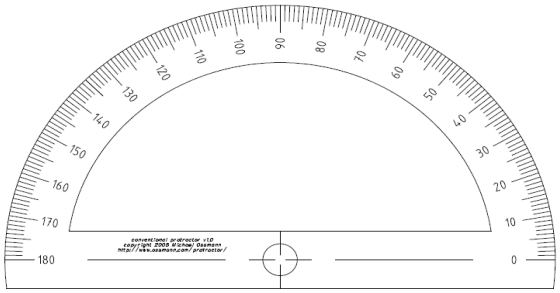
BEHI Field Form - Complete

Location description: Lockeland Springs UT2 BEHI#5 Analysis by: JGS Date: 11/8/2023

Latitude: Longitude:

BEHI category	A		B		C		D		E	
	Bank height	BH score	Root depth	RDH score	Root density	RD score	Surface protection	SP score	Bank angle	BA score
Very low	1.0 – 1.1	1 ○	90 - 100	1 ○	80 - 100	1 ○	80 - 100	1 ○	0 - 20	1 ○
Low	1.1 – 1.2	3 ◉	50 - 89	3 ◉	55 - 79	3 ○	55 - 79	3 ○	21 - 60	3 ○
Moderate	1.3 – 1.5	5 ○	30 - 49	5 ○	30 - 54	5 ◉	30 - 54	5 ◉	61 - 80	5 ○
High	1.6 – 2.0	7 ○	15 - 29	7 ○	15 - 29	7 ○	15 - 29	7 ○	81 - 90	7 ◉
Very high	2.1 – 2.8	8.5 ○	5 - 14	8.5 ○	5 - 14	8.5 ○	10 - 14	8.5 ○	91 - 119	8.5 ○
Extreme	> 2.8	10 ○	< 5	10 ○	< 5	10 ○	< 14	10 ○	> 119	10 ○

Material adjustment (F)			Stratification adjustment (G)		Total Score (Sum A-G)
Bedrock - automatically	Very low	○	No layer	◉ No adjustment	23
Boulder - automatically	Low	○	Single layer	○ (+) 5	
Cobble	(-) 10	○	Multiple layers	○ (+) 10	
Gravel or mostly gravel	(+) 5	○			
Sand or mostly sands	(+) 10	○			
Silt/loam	No adjustment	◉			
Clay	(-) 20	○			



BEHI Category: Mod-NBS-Low

Very low	Low	Moderate	High	Very high	Extreme
≤ 9.5	10 - 19.5	20 - 29.5	30 - 39.5	40 - 45	> 45

Comments:

Eroding 5'

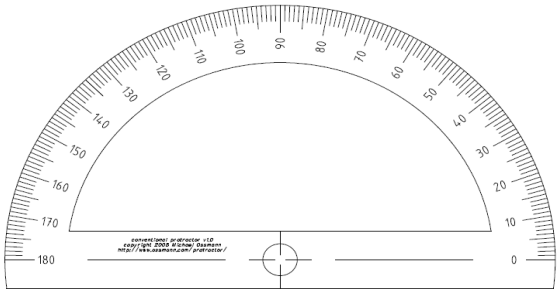
BEHI Field Form - Complete

Location description: Lockeland Springs UT2 BEHI#6 Analysis by: JGS Date: 11/8/2023

Latitude: Longitude:

BEHI category	A		B		C		D		E	
	Bank height	BH score	Root depth	RDH score	Root density	RD score	Surface protection	SP score	Bank angle	BA score
Very low	1.0 – 1.1	1 ○	90 - 100	1 ○	80 - 100	1 ○	80 - 100	1 ○	0 - 20	1 ○
Low	1.1 – 1.2	3 ◉	50 - 89	3 ◉	55 - 79	3 ○	55 - 79	3 ○	21 - 60	3 ○
Moderate	1.3 – 1.5	5 ○	30 - 49	5 ○	30 - 54	5 ◉	30 - 54	5 ◉	61 - 80	5 ◉
High	1.6 – 2.0	7 ○	15 - 29	7 ○	15 - 29	7 ○	15 - 29	7 ○	81 - 90	7 ○
Very high	2.1 – 2.8	8.5 ○	5 - 14	8.5 ○	5 - 14	8.5 ○	10 - 14	8.5 ○	91 - 119	8.5 ○
Extreme	> 2.8	10 ○	< 5	10 ○	< 5	10 ○	< 14	10 ○	> 119	10 ○

Material adjustment (F)			Stratification adjustment (G)		Total Score (Sum A-G)
Bedrock - automatically	Very low	○	No layer	◉ No adjustment	21
Boulder - automatically	Low	○	Single layer	○ (+) 5	
Cobble	(-) 10	○	Multiple layers	○ (+) 10	
Gravel or mostly gravel	(+) 5	○			
Sand or mostly sands	(+) 10	○			
Silt/loam	No adjustment	◉			
Clay	(-) 20	○			



BEHI Category: Mod-NBS-High

Very low	Low	Moderate	High	Very high	Extreme
≤ 9.5	10 - 19.5	20 - 29.5	30 - 39.5	40 - 45	> 45

Comments:

Eroding 6'

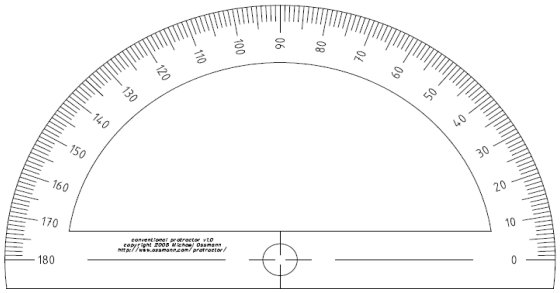
BEHI Field Form - Complete

Location description: Lockeland Springs UT2 BEHI#7 Analysis by: JGS Date: 11/8/2023

Latitude: Longitude:

BEHI category	A		B		C		D		E	
	Bank height	BH score	Root depth	RDH score	Root density	RD score	Surface protection	SP score	Bank angle	BA score
Very low	1.0 – 1.1	1 ◉	90 - 100	1 ◉	80 - 100	1 ○	80 - 100	1 ◉	0 - 20	1 ○
Low	1.1 – 1.2	3 ○	50 - 89	3 ○	55 - 79	3 ○	55 - 79	3 ○	21 - 60	3 ◉
Moderate	1.3 – 1.5	5 ○	30 - 49	5 ○	30 - 54	5 ◉	30 - 54	5 ○	61 - 80	5 ○
High	1.6 – 2.0	7 ○	15 - 29	7 ○	15 - 29	7 ○	15 - 29	7 ○	81 - 90	7 ○
Very high	2.1 – 2.8	8.5 ○	5 - 14	8.5 ○	5 - 14	8.5 ○	10 - 14	8.5 ○	91 - 119	8.5 ○
Extreme	> 2.8	10 ○	< 5	10 ○	< 5	10 ○	< 14	10 ○	> 119	10 ○

Material adjustment (F)			Stratification adjustment (G)		Total Score (Sum A-G)
Bedrock - automatically	Very low	○	No layer	◉ No adjustment	11
Boulder - automatically	Low	○	Single layer	○ (+) 5	
Cobble	(-) 10	○	Multiple layers	○ (+) 10	
Gravel or mostly gravel	(+) 5	○			
Sand or mostly sands	(+) 10	○			
Silt/loam	No adjustment	◉			
Clay	(-) 20	○			



BEHI Category: Low-NBS-Mod

Very low	Low	Moderate	High	Very high	Extreme
≤ 9.5	10 - 19.5	20 - 29.5	30 - 39.5	40 - 45	> 45

Comments:

Stable 8'

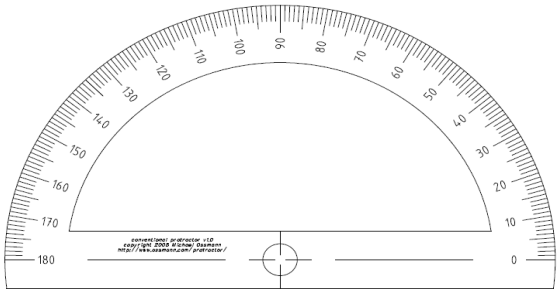
BEHI Field Form - Complete

Location description: Lockeland Springs UT2 BEHI#8 Analysis by: JGS Date: 11/8/2023

Latitude: Longitude:

BEHI category	A		B		C		D		E	
	Bank height	BH score	Root depth	RDH score	Root density	RD score	Surface protection	SP score	Bank angle	BA score
Very low	1.0 – 1.1	1 ○	90 - 100	1 ○	80 - 100	1 ○	80 - 100	1 ○	0 - 20	1 ○
Low	1.1 – 1.2	3 ◉	50 - 89	3 ◉	55 - 79	3 ○	55 - 79	3 ○	21 - 60	3 ○
Moderate	1.3 – 1.5	5 ○	30 - 49	5 ○	30 - 54	5 ○	30 - 54	5 ◉	61 - 80	5 ◉
High	1.6 – 2.0	7 ○	15 - 29	7 ○	15 - 29	7 ◉	15 - 29	7 ○	81 - 90	7 ○
Very high	2.1 – 2.8	8.5 ○	5 - 14	8.5 ○	5 - 14	8.5 ○	10 - 14	8.5 ○	91 - 119	8.5 ○
Extreme	> 2.8	10 ○	< 5	10 ○	< 5	10 ○	< 14	10 ○	> 119	10 ○

Material adjustment (F)			Stratification adjustment (G)		Total Score (Sum A-G)
Bedrock - automatically	Very low	○	No layer	◉ No adjustment	23
Boulder - automatically	Low	○	Single layer	○ (+) 5	
Cobble	(-) 10	○	Multiple layers	○ (+) 10	
Gravel or mostly gravel	(+) 5	○			
Sand or mostly sands	(+) 10	○			
Silt/loam	No adjustment	◉			
Clay	(-) 20	○			



BEHI Category: Mod-NBS-Mod

Very low	Low	Moderate	High	Very high	Extreme
≤ 9.5	10 - 19.5	20 - 29.5	30 - 39.5	40 - 45	> 45

Comments:

Eroding 6'

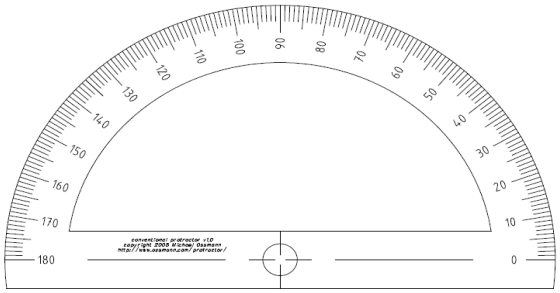
BEHI Field Form - Complete

Location description: Lockeland Springs UT2 BEHI#9 Analysis by: JGS Date: 11/8/2023

Latitude: Longitude:

BEHI category	A		B		C		D		E	
	Bank height	BH score	Root depth	RDH score	Root density	RD score	Surface protection	SP score	Bank angle	BA score
Very low	1.0 – 1.1	1 ○	90 - 100	1 ○	80 - 100	1 ○	80 - 100	1 ○	0 - 20	1 ○
Low	1.1 – 1.2	3 ○	50 - 89	3 ○	55 - 79	3 ○	55 - 79	3 ○	21 - 60	3 ○
Moderate	1.3 – 1.5	5 ◉	30 - 49	5 ◉	30 - 54	5 ○	30 - 54	5 ◉	61 - 80	5 ◉
High	1.6 – 2.0	7 ○	15 - 29	7 ○	15 - 29	7 ◉	15 - 29	7 ○	81 - 90	7 ○
Very high	2.1 – 2.8	8.5 ○	5 - 14	8.5 ○	5 - 14	8.5 ○	10 - 14	8.5 ○	91 - 119	8.5 ○
Extreme	> 2.8	10 ○	< 5	10 ○	< 5	10 ○	< 14	10 ○	> 119	10 ○

Material adjustment (F)			Stratification adjustment (G)		Total Score (Sum A-G)
Bedrock - automatically	Very low	○	No layer	◉ No adjustment	27
Boulder - automatically	Low	○	Single layer	○ (+) 5	
Cobble	(-) 10	○	Multiple layers	○ (+) 10	
Gravel or mostly gravel	(+) 5	○			
Sand or mostly sands	(+) 10	○			
Silt/loam	No adjustment	◉			
Clay	(-) 20	○			



BEHI Category: Mod-NBS-Mod

Very low	Low	Moderate	High	Very high	Extreme
≤ 9.5	10 - 19.5	20 - 29.5	30 - 39.5	40 - 45	> 45

Comments:

Eroding 11'

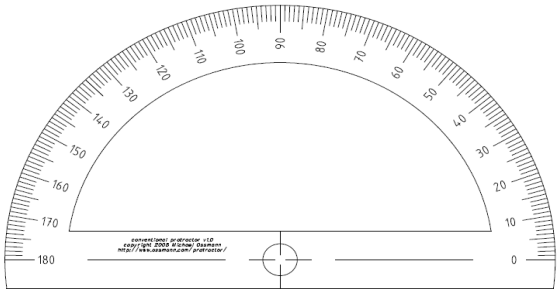
BEHI Field Form - Complete

Location description: Lockeland Springs UT2 BEHI#10 Analysis by: JGS Date: 11/8/2023

Latitude: Longitude:

BEHI category	A		B		C		D		E	
	Bank height	BH score	Root depth	RDH score	Root density	RD score	Surface protection	SP score	Bank angle	BA score
Very low	1.0 – 1.1	1 ○	90 - 100	1 ○	80 - 100	1 ○	80 - 100	1 ○	0 - 20	1 ○
Low	1.1 – 1.2	3 ○	50 - 89	3 ○	55 - 79	3 ○	55 - 79	3 ○	21 - 60	3 ○
Moderate	1.3 – 1.5	5 ○	30 - 49	5 ◉	30 - 54	5 ○	30 - 54	5 ◉	61 - 80	5 ◉
High	1.6 – 2.0	7 ◉	15 - 29	7 ○	15 - 29	7 ◉	15 - 29	7 ○	81 - 90	7 ○
Very high	2.1 – 2.8	8.5 ○	5 - 14	8.5 ○	5 - 14	8.5 ○	10 - 14	8.5 ○	91 - 119	8.5 ○
Extreme	> 2.8	10 ○	< 5	10 ○	< 5	10 ○	< 14	10 ○	> 119	10 ○

Material adjustment (F)			Stratification adjustment (G)		Total Score (Sum A-G)
Bedrock - automatically	Very low	○	No layer	◉ No adjustment	29
Boulder - automatically	Low	○	Single layer	○ (+) 5	
Cobble	(-) 10	○	Multiple layers	○ (+) 10	
Gravel or mostly gravel	(+) 5	○			
Sand or mostly sands	(+) 10	○			
Silt/loam	No adjustment	◉			
Clay	(-) 20	○			



BEHI Category: Mod-NBS-High

Very low	Low	Moderate	High	Very high	Extreme
≤ 9.5	10 - 19.5	20 - 29.5	30 - 39.5	40 - 45	> 45

Comments:

Eroding 7'

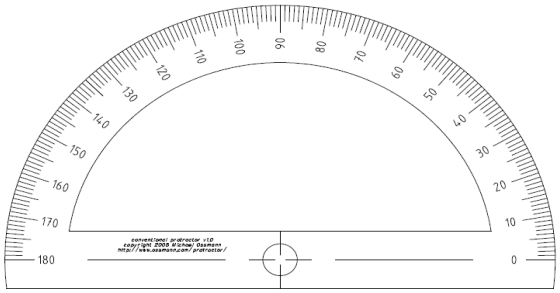
BEHI Field Form - Complete

Location description: Lockeland Springs UT2 BEHI#11 Analysis by: JGS Date: 11/8/2023

Latitude: Longitude:

BEHI category	A		B		C		D		E	
	Bank height	BH score	Root depth	RDH score	Root density	RD score	Surface protection	SP score	Bank angle	BA score
Very low	1.0 – 1.1	1 ○	90 - 100	1 ○	80 - 100	1 ○	80 - 100	1 ○	0 - 20	1 ○
Low	1.1 – 1.2	3 ○	50 - 89	3 ○	55 - 79	3 ○	55 - 79	3 ○	21 - 60	3 ○
Moderate	1.3 – 1.5	5 ◉	30 - 49	5 ◉	30 - 54	5 ○	30 - 54	5 ○	61 - 80	5 ◉
High	1.6 – 2.0	7 ○	15 - 29	7 ○	15 - 29	7 ◉	15 - 29	7 ◉	81 - 90	7 ○
Very high	2.1 – 2.8	8.5 ○	5 - 14	8.5 ○	5 - 14	8.5 ○	10 - 14	8.5 ○	91 - 119	8.5 ○
Extreme	> 2.8	10 ○	< 5	10 ○	< 5	10 ○	< 14	10 ○	> 119	10 ○

Material adjustment (F)			Stratification adjustment (G)		Total Score (Sum A-G)
Bedrock - automatically	Very low	○	No layer	◉ No adjustment	29
Boulder - automatically	Low	○	Single layer	○ (+) 5	
Cobble	(-) 10	○	Multiple layers	○ (+) 10	
Gravel or mostly gravel	(+) 5	○			
Sand or mostly sands	(+) 10	○			
Silt/loam	No adjustment	◉			
Clay	(-) 20	○			



BEHI Category: Mod-NBS-Low

Very low	Low	Moderate	High	Very high	Extreme
≤ 9.5	10 - 19.5	20 - 29.5	30 - 39.5	40 - 45	> 45

Comments:

Confluence Riffle and this BEHI includes both banks
Eroding 22'

LWD Field Form

Investigator(s)	Josh Sitz	State	TN	Survey Length	328 ft.
Date	11/8/2023	County	Davidson	Bkf Width	3.3
Stream Name	UT2	Latitude (dd)		Bkf Mean Depth	0.4
Reach ID		Longitude (dd)			
Field Notes:	No wood found.				

SCORE										
	1		2		3		4		5		
CATEGORY	*** PIECES ***										**PIECE SCORES**
Length/BKF Width	0 to 0.4		0.4 to 0.6		0.6 to 0.8		0.8 to 1.0		> 1.0		0
Diameter (cm)	10 to 20		20 to 30		30 to 40		40 to 50		>50		0
Location	Zone 4 (Above BKF/Extending into Channel)				Zone 3 (Above BKF/Within Streambanks)		Zone 2 (Above WS/Below BKF)		Zone 1 (Below WS)		0
Type	Bridge				Ramp		Submersed		Buried		0
Structure	Plain		Plain/Int		Intermediate		Int/Sticky		Sticky		0
Stability	Moveable		Mov/Int		Intermediate		Int/Sec		Secured		0
Orientation (deg)	0 to 20		20 to 40		40 to 60		60 to 80		80 to 90		0
CATEGORY	**** DEBRIS DAMS ****										**DAM SCORES**
Length (% of BKF Width)	0 to 20		20 to 40		40 to 60		60 to 80		80 to 100		0
Height (% of BKF Depth)	0 to 20		20 to 40		40 to 60		60 to 80		80 to 100		0
Structure	Coarse		Coarse/Int		Intermediate		Int/Fine		Fine		0
Location	Partially high flow		In high flow		Partially low flow		Mid low flow		In low flow		0
Stability	Moveable		Mov/Int		Intermediate		Int/Sec		Secured		0

* Pieces - Non-living wood that has a large end diameter a 10 cm and has a length a 1 m. " Debris Dams - Three (3) or more pieces touching.

LWDI SCORE	**0**

Plot Data: CVS Level 3

General Information

Project Number:

Project Name: Lockeland Springs PRM

Team: KCI Technologies

Plot: UT2 LB

Start Date: 9/ Nov/2023

Party	Role**
Josh Sitz	Plot Leader

**Roles: Co-leader, Assistant, Guide, Land owner, Taxonomist, Other

Soil Drainage*

- ☐ Excessively drained
- ☐ Somewhat excessively
- ☐ Well drained
- ☑ Moderately well d.
- ☐ Somewhat poorly d.
- ☐ Poorly drained
- ☐ Very poorly drained

Salinity*

- ☐ Saltwater
- ☐ Brackish
- ☑ Fresh
- ☐ Upland (n/a)

Soil Series / Type:

Soil Series Source:

Soil Texture*:

Rock Type*:

Surficial Deposits*:

Soil Descr.:

Location

General: Nashville

State TN County: Davidson

Quadrangle:

Place Names: 1)

2) 3)

EEP Reach:

Land Owner:

Source of coordinates: GPS (map, GPS, survey)

GPS location in plot (meters): x= 0 y= 0

Coordinate System: ☑ Lat/Long ☐ UTM ☐ State Plane ☐ Other (*specify*): _____

Coord. Units: ☑ deg. ☐ deg. min. ☐ m ☐ ft ☐ _____

Datum: ☐ NAD83/WGS84 ☐ NAD27

Zone: (if applicable)

Lat: 36.172136 **(or Northing)**

Long: -86.731353 **(or Easting)**

Coordinate Accuracy (m radius): 1m

GPS File Name:

Site Characteristics

Elevation: ± ☐m ☐ft

Slope (degrees):

Aspect (degrees):

Compass Type: ☐ magnetic ☐ true

Classification* Fit: excellent, good, fair, poor; Conf: high, med, low

Provisional comm._____

Comm.(1)_____Fit=__Conf=__

Comm.(2)_____Fit=__Conf=__

Classifier _____ Date ___/___/___

Taxonomic Standard Used for Plants

Authority: ITIS, **Publ. Date:** 11/8/17

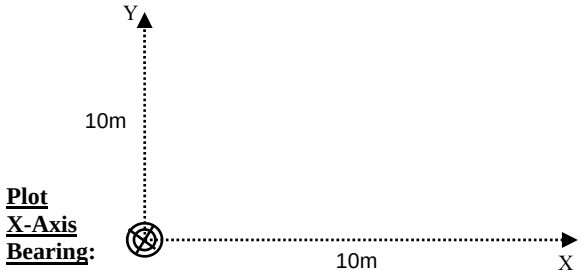
Plot Placement:

(check 1 or more)

- ☑ Representative
- ☐ Random
- ☐ Stratified
- ☐ Transect component
- ☐ Systematic (grid)
- ☐ Capture specific feature

Plot Diagram:

Draw plot boundaries and show location of any landmarks and objects in the key below. Also indicate X and Y dimensions of plot, in meters.



●Posts (x,y) (meters)
(0 , 0)
(10, 0)
(10 , 10)
(0 , 10)
(,)
(,)

Key: ◎ Plot origin (0,0) point ⊗ GPS location point → Photo taken, with direction ● Location of posts

Plot Size (ares): 1

→ Photo Identifier(s):

Topographic Position*

- ☐ Interfluve (crest, summit, ridge)
- ☐ High slope (shoulder, upper, convex)
- ☐ High level
- ☐ Midslope
- ☐ Backslope (cliff)
- ☐ Step in slope
- ☐ Lowslope (lower, foot, colluvial)
- ☐ Toeslope
- ☐ Low level (terrace)
- ☐ Channel wall (bank)
- ☐ Channel bed (valley bottom)
- ☐ Basin floor (depression)
- ☐ *Other:* _____

Cover by Strata

Canopy Height (m):

Strata	Height Range (ft)	Total Cover (%)
Tree	X	0%
Shrub	X	0%
Herb	X	100%
(**F**loating)	-	
(**A**quatic Submerged)	-	

Height defaults listed, but can be edited if other values better suit vegetation.

Hydrologic Regime*

- ☐ Upland (seldom flooded)
- ☐ Intermittently/seasonally saturated (seldom flooded)
- ☐ Permanently/ semipermanently saturated (dry < 1 / yr, seldom flooded)
- ☐ Occasionally flooded (<1 / yr)
- ☐ Temporarily flooded
- ☐ Intermittently flooded
- ☐ Semipermanently flooded
- ☐ Permanently flooded
- ☐ Tidally flooded - daily
- ☐ Tidally flooded - monthly
- ☐ Tidally flooded - irregular (wind, storms)
- ☐ Unknown

Water

Percent of Plot Submerged: 0 %

Mean Water Depth Now: 0 cm

Closest Dist. to Shore: 0 m

Landform Type*:

Notes

If more space is needed, check the box and use back of datasheets

Date plot was last planted (MM/YYYY): (baseline or if since last monitoring)

Layout: (anything unusual about plot layout and shape) ☐ more...

Plot Location: (directions to plot, landscape content) ☐ more...

Plot Rationale: (why location was chosen for the plot) ☐ more...

Vegetation: (characterization of community, dominants, and principle strata) ☐ more...

Natural Woody Stem Data: CVS Levels 2 - 3

Team: KCI Leader: JS Project: Lockeland Springs PRM Plot: UT2 LB Date: 11/9/2023 Area (=100m²): 1

Species Name		Seedlings - Height Class			Saplings - DBH										
Common Name	**Scientific Name**	10-50cm 3.9-19.7in	50-100cm 19.7-39.4in	100-137cm 39.4-53.9in	0-1cm 0-0.4in	1-2.5cm 0.4-1.0in	2.5-5cm 1.0-2.0in	5-10cm 2.0-3.9in	10-15cm 3.9-5.9in	15-20cm 5.9-7.9in	20-25cm 7.9-9.8in	25-30cm 9.8-11.8in	30-35cm 11.8-13.8in	35-40cm 13.8-15.7in	>40cm >15.7in
	None														
	Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Average DBH by Class (cm)	#DIV/0!		#DIV/0!								
				Average DBH (inches)	**#DIV/0!**										
				Stem Density	**0.0**										

Team: KCI Leader: JS Project: Lockeland Springs PRM Plot: UT2 LB Date: 11/9/2023 Ares (=100m²): 1

Strata					Species Name		Invasive	Modules		
T	S	H	(F)	(A)	Common Name	Scientific Name				
		6			eastern bottlebrush grass	*Elymus hystrix*	NO			
		7			bearded beggarticks	*Bidens aristosa*	NO			
		7			mixed grasses					
		6			giant ironweed	*Vernonia gigantea*	NO			

Cover: trace=1; 0-1%=2; 1-2%=3; 2-5%=4; 5-10%=5; 10-25%=6; 25-50%=7; 50-75%=8; 75-95%=9; 95-100%=*

Plot Data: CVS Level 3

General Information

Project Number:

Project Name: Lockeland Springs PRM

Team: KCI Technologies

Plot: UT2 RB

Start Date: 9/ NOV/2023

Party	Role**
Josh Sitz	Plot Leader

**Roles: Co-leader, Assistant, Guide, Land owner, Taxonomist, Other

Soil Drainage*

- ☐ Excessively drained
- ☐ Somewhat excessively
- ☐ Well drained
- ☑ Moderately well d.
- ☐ Somewhat poorly d.
- ☐ Poorly drained
- ☐ Very poorly drained

Salinity*

- ☐ Saltwater
- ☐ Brackish
- ☑ Fresh
- ☐ Upland (n/a)

Soil Series / Type:

Soil Series Source:

Soil Texture*:

Rock Type*:

Surficial Deposits*:

Soil Descr.:

Location

General: Nashville

State: TN County: Davidson

Quadrangle:

Place Names: 1)

2) 3)

EEP Reach:

Land Owner:

Source of coordinates: GPS (map, GPS, survey)

GPS location in plot (meters): x= 0 y= 0

Coordinate System: ☑ Lat/Long ☐ UTM ☐ State Plane ☐ Other (*specify*): _____

Coord. Units: ☑ deg. ☐ deg. min. ☐ m ☐ ft ☐ _____

Datum: ☐ NAD83/WGS84 ☐ NAD27

Zone: (if applicable)

Lat: 36.172048 **(or Northing)**

Long: -86.731353 **(or Easting)**

Coordinate Accuracy (m radius): 1m

GPS File Name:

Site Characteristics

Elevation: ± ☐m ☐ft

Slope (degrees):

Aspect (degrees):

Compass Type: ☐ magnetic ☐ true

Classification*

Fit:excellent,good, fair, poor; Conf: high, med, low

Provisional comm._____

Comm.(1)_____Fit=__Conf=__

Comm.(2)_____Fit=__Conf=__

Classifier _____ Date ___/___/___

Taxonomic Standard Used for Plants

Authority: ITIS, **Publ. Date:** 11/8/17

Plot Placement:

(check 1 or more)

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- ☐ Transect component
- ☐ Systematic (grid)
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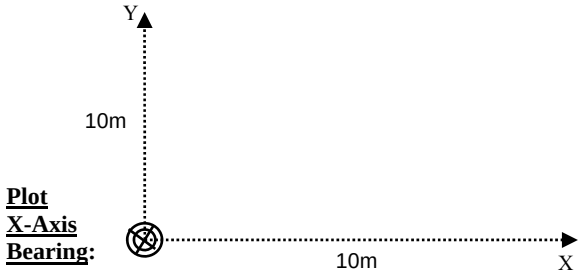

●Posts (x,y) (meters)
(0 , 0)
(10, 0)
(10 , 10)
(0 , 10)
(,)
(,)

Key: ◎ Plot origin (0,0) point ⊗ GPS location point → Photo taken, with direction ● Location of posts

Plot Size (ares): 1

→ Photo Identifier(s):

Topographic Position*

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- ☐ High slope (shoulder, upper, convex)
- ☐ High level
- ☐ Midslope
- ☐ Backslope (cliff)
- ☐ Step in slope
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- ☐ Low level (terrace)
- ☐ Channel wall (bank)
- ☐ Channel bed (valley bottom)
- ☐ Basin floor (depression)
- ☐ *Other:* _____

Cover by Strata

Canopy Height (m):

Strata	Height Range (ft)	Total Cover (%)
Tree	X	0%
Shrub	X	0%
Herb	X	100%
(**F**loating)	-	
(**A**quatic Submerged)	-	

Height defaults listed, but can be edited if other values better suit vegetation.

Hydrologic Regime*

- ☐ Upland (seldom flooded)
- ☐ Intermittently/seasonally saturated (seldom flooded)
- ☐ Permanently/ semipermanently saturated (dry < 1 / yr, seldom flooded)
- ☐ Occasionally flooded (<1 / yr)
- ☐ Temporarily flooded
- ☐ Intermittently flooded
- ☐ Semipermanently flooded
- ☐ Permanently flooded
- ☐ Tidally flooded - daily
- ☐ Tidally flooded - monthly
- ☐ Tidally flooded - irregular (wind, storms)
- ☐ Unknown

Water

Percent of Plot Submerged: 0 %

Mean Water Depth Now: 0 cm

Closest Dist. to Shore: 0 m

Landform Type*:

Notes

If more space is needed, check the box and use back of datasheets

Date plot was last planted (MM/YYYY): (baseline or if since last monitoring)

Layout: (anything unusual about plot layout and shape) ☐ more...

Plot Location: (directions to plot, landscape content) ☐ more...

Plot Rationale: (why location was chosen for the plot) ☐ more...

Vegetation: (characterization of community, dominants, and principle strata) ☐ more...

Natural Woody Stem Data: CVS Levels 2 - 3

Team: KCI Leader: JS Project: Lockeland Springs PRM Plot: UT2 RB Date: 11/9/2023 Area (=100m²): 1

Species Name		Seedlings - Height Class			Saplings - DBH										
Common Name	**Scientific Name**	10-50cm 3.9-19.7in	50-100cm 19.7-39.4in	100-137cm 39.4-53.9in	0-1cm 0-0.4in	1-2.5cm 0.4-1.0in	2.5-5cm 1.0-2.0in	5-10cm 2.0-3.9in	10-15cm 3.9-5.9in	15-20cm 5.9-7.9in	20-25cm 7.9-9.8in	25-30cm 9.8-11.8in	30-35cm 11.8-13.8in	35-40cm 13.8-15.7in	>40cm >15.7in
	None														
	Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				Average DBH by Class (cm)	#DIV/0!		#DIV/0!								
				Average DBH (inches)	**#DIV/0!**										
				Stem Density	**0.0**										

Team: KCI Leader: JS Project: Lockeland Springs PRM Plot: UT2 RB VP Date: 11/9/2023 Ares (=100m²): 1

Strata					Species Name		Invasive	Modules		
T	S	H	(F)	(A)	Common Name	Scientific Name				
		5			aster	*Aster spp.*	NO			
		5			Mixed Grasses		NO			
		9			common blue violet	*Viola sororia*	NO			

Cover: trace=1; 0-1%=2; 1-2%=3; 2-5%=4; 5-10%=5; 10-25%=6; 25-50%=7; 50-75%=8; 75-95%=9; 95-100%=*

Benthic invertebrate sample processing for KCI - Nashville
Aquatic Resources Center, Inc Project No. 1046

Two benthic invertebrate samples were received from KCI - Nashville for processing, identification, enumeration, and biological measures calculation. The samples were collected by KCI personnel on 26 April 2024. Below is a brief description of the processing methods and results.

Samples were washed using a US Series No. 35 (500 µm mesh) sieve to remove ethanol and excess detritus. Each sample contained a large amount of material (detritus and organisms) and was subsampled using the Caton (1991) method, which is recommended by TDEC (revised 2021). This procedure consists of dividing a given sample into 30 equal portions (termed grids) using a specified subsampling device, then sorting at least four of these grids (which have been randomly selected) to obtain 200 ± 20 percent (160 - 240) organisms. If sorting of a grid had started, it was finished in its entirety. The benthic organisms removed from the sample were placed by major groupings (e.g., mayflies, worms, snails) into glass vials containing 70 percent EtOH (ethyl alcohol). Each vial was labeled with information such as date of collection, location, specific sample identification, name of taxonomic group and number of organisms. The residue from the sorted portion of the sample was preserved separately from the portion that was not sorted. Organisms were identified using either a dissecting or compound microscope. The latter microscope was used for identifying chironomids (midgefly larvae) and oligochaetes (aquatic segmented worms) after these organisms were mounted on microscope slides using CMC mounting medium. Most organisms were identified to the generic level, unless the specimens were too small, immature, or damaged to allow identification to this level. When identifications were complete, the data were entered onto an Excel spreadsheet and checked for accuracy.

A total of 34 taxa was identified. Tolerance values ranged from 2.4 (*Micropsectra*) to 10.0 (Enchytraeidae and immature Tubificinae). There were seven taxa classified as having "clinger" habit and thirteen taxa classified as nutrient tolerant. These data were used in the calculations of the biological measures required by TDEC (revised 2021) and the values for these measures are shown in the table below.

Station	**CUMBE193.4T0.4DA**	**LOCKET0.52DV**	**CUMBE193.4T0.4DA**	**LOCKET0.52DV**
Bioregion	**71h**	**71h**		
Drainage area	**≤ 2.5 sq. mi.**	**≤ 2.5 sq. mi.**		
Biological Measure	**Value**	**Value**	**Score**	**Score**
Taxa Richness	18	23	2	4
EPT Richness	0	2	0	0
Percent EPT – *Cheumatopsyche*	0	5.1	0	0
Percent Oligochaeta and Chironomidae	95.7	10.2	0	6
NCBI	5.31	6.10	4	4
Percent Clinger - *Cheumatopsyche*	6.1	23.3	0	2
Percent Nutrient Tolerant	20.8	55.1	6	2
Tennessee Macroinvertebrate Index (TMI)			12	18

							Tolerance	Clinger	Nutrient
Phylum	Class	Order	Family	Taxon	CUMBE193.4T0.4DA	LOCKET0.52DV	Value	Habit	Tolerant
Annelida	Clitellata	Enchytraeida	Enchytraeidae	Enchytraeidae		1	10		x
Annelida	Clitellata	Tubificida	Naididae	*Aulodrilus*	5		7		x
Annelida	Clitellata	Tubificida	Naididae	*Limnodrilus*	1		8.5		x
Annelida	Clitellata	Tubificida	Naididae	*Potamothrix*		1	na		x
Annelida	Clitellata	Tubificida	Naididae	Tubificinae: bifid chaetae	9	1	10		x
Arthripoda	Crustacea	Decapoda	Cambaridae	Cambaridae		1	7.5		
Arthripoda	Crustacea	Isopoda	Asellidae	*Lirceus*		8	7.4		x
Arthripoda	Arachnida	Trombidiformes	Hygrobatidae	*Hygrobates*		1	6		
Arthripoda	Insecta	Coleoptera	Elmidae	*Stenelmis*		17	5.6	x	x
Arthripoda	Insecta	Diptera	Ceratopogonidae	Ceratopogoninae	1		6		
Arthripoda	Insecta	Diptera	Ceratopogonidae	Ceratopogonidae	2		6		
Arthripoda	Insecta	Diptera	Ceratopogonidae	*Forcipomyia*		2	6		
Arthripoda	Insecta	Diptera	Chironomidae	*Alotanypus*	1		9		
Arthripoda	Insecta	Diptera	Chironomidae	*Chironomus*	15	1	9.3		
Arthripoda	Insecta	Diptera	Chironomidae	*Conchapelopia*	2		8.7		
Arthripoda	Insecta	Diptera	Chironomidae	*Cricotopus*	10		8.7	x	x
Arthripoda	Insecta	Diptera	Chironomidae	*Cricotopus/Orthocladius*	2		7.6	x	x
Arthripoda	Insecta	Diptera	Chironomidae	*Dicrotendipes*		1	7.2		
Arthripoda	Insecta	Diptera	Chironomidae	*Micropsectra*	107		2.4		
Arthripoda	Insecta	Diptera	Chironomidae	*Parametriocnemus*	1	2	3.9		
Arthripoda	Insecta	Diptera	Chironomidae	*Paratanytarsus*		1	8		
Arthripoda	Insecta	Diptera	Chironomidae	*Paratendipes*	1		5.6		
Arthripoda	Insecta	Diptera	Chironomidae	*Phaenopsectra*		1	7.6	x	
Arthripoda	Insecta	Diptera	Chironomidae	*Polypedilum*	16	3	6.7		x
Arthripoda	Insecta	Diptera	Chironomidae	*Procladius*	8		8.8		
Arthripoda	Insecta	Diptera	Chironomidae	*Psectrotanypus*	1		3.8		
Arthripoda	Insecta	Diptera	Chironomidae	*Rheotanytarsus*		2	6.2	x	
Arthripoda	Insecta	Diptera	Chironomidae	Tanypodinae	8		5.4		
Arthripoda	Insecta	Diptera	Chironomidae	*Tanytarsus*		1	6.6		
Arthripoda	Insecta	Diptera	Chironomidae	*Thienemanniella*	9		6.4		
Arthripoda	Insecta	Diptera	Chironomidae	*Thienemannimyia* group	6		8.4		
Arthripoda	Insecta	Diptera	Chironomidae	*Thienemannimyia/Meropelopia*	18	2	8.4		

Arthripoda	Insecta	Diptera	Chironomidae	*Zavrelimyia*	1	1	2.7		
Arthripoda	Insecta	Diptera	Simuliidae	*Simulium*	2	18	4.9	x	
Arthripoda	Insecta	Ephemeroptera	Baetidae	*Baetis*		6	4.18		
Arthripoda	Insecta	Trichoptera	Hydroptilidae	*Hydroptila*		3	6.5	x	
Mollusca	Bivalvia	Veneroida	Pisidiidae	Pisidiidae		32	6.9		
Mollusca	Bivalvia	Veneroida	Pisidiidae	*Pisidium*		4	6.6		
Mollusca	Gastropoda	Neotaenioglossa	Pleuroceridae	*Pleurocera (Elimia)*		4	5.75		x
Mollusca	Gastropoda	Neotaenioglossa	Pleuroceridae	Pleuroceridae		62	6		x
Mollusca	Gastropoda	Basommatophora	Physidae	*Physa*	5		8.7		x
				Total individuals	231	176			

SAMPLE ID LOCKET.52DA LOCATION UT Lockeland Spr Type SQIC PROJECT 1046

Date Collected 26 Apr 24 Grids: sorted/total 4/30 v 3/16 Habitat Sorter RTH Date 2 May 24

Total 1776 Taxa 23 Other info UT 1 Reach 2. EPT=2, %EPT-Cheum=5.1, %OC=10.2 Log# B1046.0001

Oligochaeta 3 Bivalv/Gastro 102 Other 47
Chironomidae 15 Orth/Cole/Hem 9

Decapoda	
Cambaridae (juv)	1
Isopoda	
Lirceus	8
Trombidiformes	
Hygrobates	1
Ephemeroptera	
Baetis	6
Trichoptera	
Hydroptila	3
Coleoptera	
Stenelmis (14L, 3A)	17
Diptera	
Forcipomyia	2
Simulium	18
Bivalvia	
Pisidium	4
x Pisidiidae (small)	32
Gastropoda	
Pleurocera (Elimia)	4
x Pleuroceridae (≤ 1mm)	62

Oligochaeta	
Enchytraeidae	1
Potamothrix	1
Tubificinae: bifid chaetae	1
Chironomidae	
Chironomus	1
Dicrotendipes	1
Parametriocnemus	2
Paratanytarsus	1
Phaenopsectra	1
Polypedilum	3
Rheotanytarsus	2
Tanytarsus (P)	1
Thienemannimyia/Meropelopia	2
Zavrelimyia	1

Non-counts:

Comments:

Date IDD: 3 May 24

(alphanumeric code) = voucher collection, ei = early instar, L = larva, A = adult, P = pupa, x = not counted as a separate taxon

SAMPLE ID STR-1 LOCATION CUMBE193.4TO194A Type SQK PROJECT 1046

Date Collected 26Apr24 Grids: sorted/total 4/30 & 3/16 Habitat 71h Sorter TWA Date 02May24

Total 231 Taxa 18 Other info %PT=0, %EPT=0, %0 C= 95.7 Drainage = 0.11 Log# B10460002

Oligochaeta	15	Mollusca	5
Chironomidae	206	Others	5

Gastropoda	
Physa	5
Diptera	
Ceratopogoninae (Bezzia grp)	1
x Ceratopogonidae (P)	2
Simulium (1L, 1P)	2
Oligochaeta	
Aulodrilus	5
Limnodrilus	1
x Tubificinae: bifid chaetae	9

Chironomidae	
Chironomus (1P)	15
Conchapelopia	2
Cricotopus	10
x Cricotopus/Orthocladius (P)	2
Alotanypus	1
Micropsectra (4P)	107
Polypedilum	16
Procladius	8
Psectrotanypus	1
x Tanypodinae (ei)	8
Thienemanniella (1P)	9
Parametriocnemus	1
Paratendipes	1
x Thienemanniyia group (ei/P)	6
Thienemanniyia/Meropelopia	18
Zavrelimyia	1

Non-counts:

Comments:

Date IDD: 2May24

(alphanumeric code) = voucher collection, ei = early instar, L = larva, A = adult, P = pupa, x = not counted as a separate taxon

Appendix D

Site Photos

Monitoring Photos – Photographic Reference Points

PRP 1 - Looking Upstream at beginning of UT1 Reach 1

PRP 1- Looking Downstream at oversized concrete channel on UT1 Reach 1

PRP 2 - Looking Upstream at oversized concrete channel on UT1 Reach 1

PRP 3 - Looking Upstream at oversized concrete channel on UT1 Reach 1

PRP 4 – Looking at wetland on right bank of UT1 Reach 1

PRP 5 – Looking Upstream on UT1 Reach 2 showing thick Chinese privet

Monitoring Photos – Photographic Reference Points, Continued

PRP 5 – Looking Downstream at Chinese privet-lined UT1 Reach 2

PRP 6 – Looking Upstream on UT1 Reach 2 showing armoring

PRP 7 – Looking Downstream on UT2

PRP 8 – Looking Downstream on UT1 Reach 2 showing stream buffer

PRP 9 – Looking Downstream on UT1 Reach 2 showing stream buffer

PRP 10- Looking eroding left bank on UT1 Reach 2

Monitoring Photos – Photographic Reference Points, Continued

PRP 11 - Looking Upstream at mowed left bank on UT1 Reach 2

Appendix E

Stream Design Plans

STATE	KCI PROJECT NO.	SHEET NO.	TOTAL SHEETS
TN	162308039	1	11

A	60% DESIGN PLANS	09/2023	
B	60% DESIGN PLANS	02/2024	
C	FINAL CONSTRUCTION PLANS	05/2024	
SYM.	DESCRIPTION	DATE	APPROVED
REVISIONS			

KCI TECHNOLOGIES

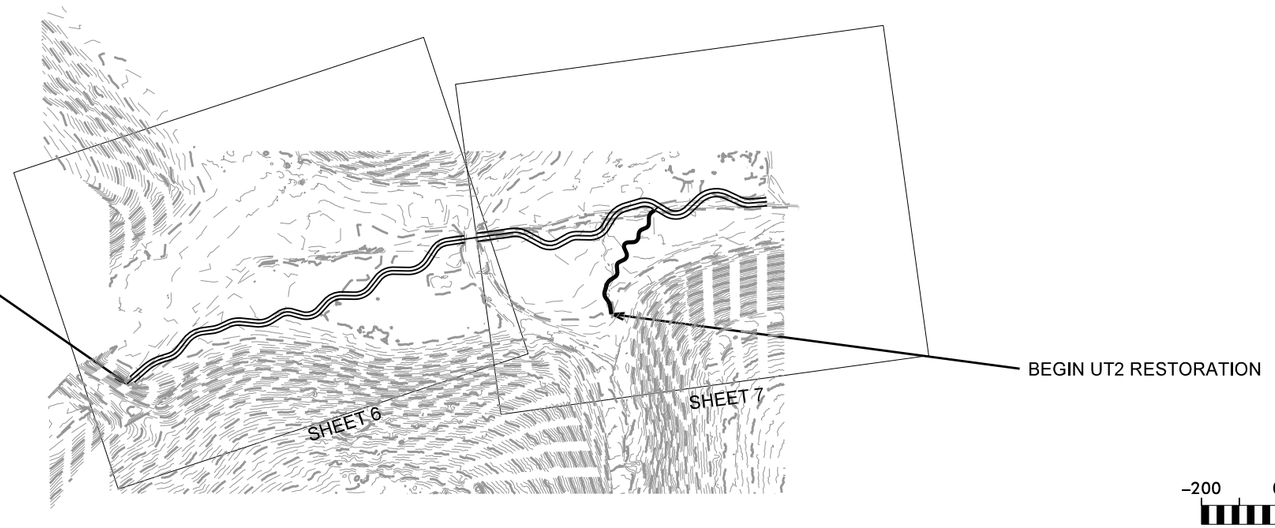
LOCKELAND SPRINGS STREAM RESTORATION

LOCATION: TWO UNNAMED TRIBUTARIES IN SHELBY GOLF COURSE AND SHELBY PARK NASHVILLE, TENNESSEE

TYPE OF WORK: STREAM RESTORATION

VICINITY MAP
NOT TO SCALE

ISSUING AGENCY	*PERMIT #*
USACE NWP27:	*LRN–2023–00794*
TDEC ARAP:	*NRS23.27C*
TDEC NPDES:	*TBD*



INDEX OF SHEETS

–200 0 150 300

TN GRID NAD '83

FINAL CONSTRUCTION PLANS

GRAPHIC SCALES
SEE SHEETS

LOCKELAND SPRINGS STREAM RESTORATION CREDIT TABLE

STREAM REACH	EXISTING LENGTH (LF)	MITIGATION TYPE	PROPOSED LENGTH (LF)	FUNCTIONAL FOOT CREDITS
UT1 REACH 1*	762	RE-ESTABLISHMENT	702	357.8
UT1 REACH 2*	515	REHABILITATION	550	183.4
UT2	208	REHABILITATION	228	40.7
TOTAL	1485		1480	582.0

* NOTE: INCLUDES 5% INCREASE IN FUNCTIONAL CREDITS DUE TO ADJACENT WETLANDS.

Prepared in the Office of:

KCI TECHNOLOGIES
500 11TH AVENUE NORTH, SUITE 290
NASHVILLE, TN 37203

PROJECTED START DATE
SUMMER 2024

PROJECTED COMP. DATE
FALL 2024

GARY M. MRYNCZA, P.E.
PROJECT ENGINEER

JOSH SITZ AND EVAN WHITE
NATURAL CHANNEL DESIGN

GARY MICHAEL MRYNCZA REGISTERED ENGINEER AGRICULTURE COMMERCE No. 111554 STATE OF TENNESSEE

Prepared for:

METRO WATER SERVICES

GENERAL NOTES:

ALL BEARINGS ARE BASED ON NAD '83 GRID BEARINGS. ALL DISTANCES AND COORDINATES SHOWN ARE HORIZONTAL (GROUND) VALUES.

EFFORT SHALL BE TAKEN TO MINIMIZE DISTURBANCE IN THE STREAM CHANNEL AND IN GAINING ACCESS TO/FROM THE WORK AREA.

IMPLEMENTED SEDIMENTATION AND EROSION CONTROLS SHALL BE IN ACCORDANCE WITH FEDERAL, STATE, AND LOCAL EROSION CONTROL REGULATIONS.

CONTRACTOR SHALL KEEP ALL SURROUNDING PUBLIC ROADWAYS AND DRAINAGE SYSTEMS FREE FROM DIRT, MUD, AND CONSTRUCTION DEBRIS AT ALL TIMES.

CONTRACTOR SHALL BE RESPONSIBLE FOR THE REPAIR OF ANY ITEMS DAMAGED DURING CONSTRUCTION, INCLUDING FENCING, ROADS, ETC., UNLESS A DIFFERENT AGREEMENT IS DECIDED UPON BY METRO WATER AND GOLF.

ALL EARTH MOVING EQUIPMENT SHALL BE SERVICED PRIOR TO WORK COMMENCING EACH MORNING. EQUIPMENT SHALL BE MAINTAINED TO PREVENT FUEL, OIL AND LUBRICANT SPILLS INTO THE WATERWAY AND/OR RIPARIAN AREA.

SUBSURFACE:

EXCEPT FOR THAT SPECIFIED IN THESE NOTES AND ON THE PLANS, NO SUBSURFACE DATA IS MADE AVAILABLE TO THE CONTRACTOR FOR THIS PROJECT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAKING HIS OWN SUBSURFACE INVESTIGATIONS AS THEY RELATE TO THIS PROJECT.

MATERIALS:

EXCAVATED MATERIAL SHALL TEMPORARILY BE STOCKPILED IN NON-FORESTED AND NON-WETLAND AREAS WITHIN THE LIMITS OF DISTURBANCE. EXACT LOCATION OF THE TEMPORARY SPOIL AREAS SHALL BE DETERMINED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER. THE CONTRACTOR SHALL BE RESPONSIBLE FOR INSTALLING APPROPRIATE STABILIZATION MEASURES OUTSIDE OF THE SPOIL AREAS TO PREVENT EROSION AND SEDIMENTATION.

THE CONTRACTOR SHALL STOCKPILE TREES (WITH AND WITHOUT ROOT BALL) WITH A DIAMETER GREATER THAN 12" AND ROCKS AND COBBLE FROM EXCAVATION FOR USE IN BANK STABILIZATION, GRADE CONTROL, AND IN-STREAM STRUCTURES.

UTILITIES:

OVERHEAD POWER LINES EXIST OVER UT1 AND UT2. THE CONTRACTOR SHALL FIELD VERIFY ALL UTILITIES INSIDE THE LIMIT OF DISTURBANCE.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE INCURRED TO ANY UTILITY SERVICE LINE AT NO COST OR OBLIGATION TO THE OWNER. THE LOCATION OF THE SEWER LINES SHOWN IN THE PLAN AND PROFILE ARE APPROXIMATE AND SHALL BE FIELD VERIFIED BY THE CONTRACTOR.

CONTRACTOR SHOULD CALL THE "CALL BEFORE YOU DIG" NUMBER FOR UTILITY LOCATIONS (800-351-1111 OR 811) PRIOR TO COMMENCEMENT OF EARTHWORK.

SEWER LINE CROSSING TABLE

CROSSING NO.	REACH	STATIONING	INLET MANHOLE INVERT (FT)	OUTLET MANHOLE INVERT (FT)	PIPE SIZE (IN)	TOP OF PIPE ELEV (FT)	PROPOSED THALWEG ELEV (FT)	COVER ABOVE PIPE (FT)
1	1	12+83.23	414.45	413.39	8	414.93	415.67	0.74
2	2	20+20.40	407.94	405.94	10	408.27	409.68	1.41
3	Ditch	42+95.07	411.72	405.97	36	411.04	412.85	1.81

APPROVED:

DATE:

PROJECT LEGEND

EXISTING NATURAL FEATURES

EXISTING WETLANDS

TOPOGRAPHY

MAJOR EXISTING CONTOUR LINE — 720 —

MINOR EXISTING CONTOUR LINE

MAJOR PROPOSED CONTOUR LINE — 720 —

MINOR PROPOSED CONTOUR LINE

UTILITIES

EXISTING POWER POLE

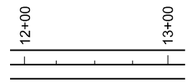
EXISTING POWER LINE — OW — OW —

SANITARY SEWER LINE — SS — SS —

SANITARY SEWER MANHOLE (S)

STREAM RESTORATION

PROPOSED THALWEG W/ APPROXIMATE BANKFULL LIMITS



RIFFLE GRADE CONTROL

CONSTRUCTED RIFFLE WITH SOIL LIFT

CONSTRUCTED RIFFLE WITH LINER

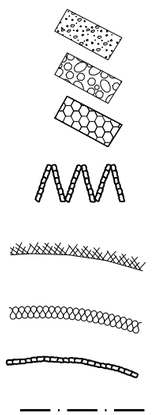
CASCADING RIFFLE

TOE WOOD WITH SOIL LIFT

STONE TOE WITH SOIL LIFT

BOULDER TOE WITH SOIL LIFT

PROTECTED MITIGATION AREA



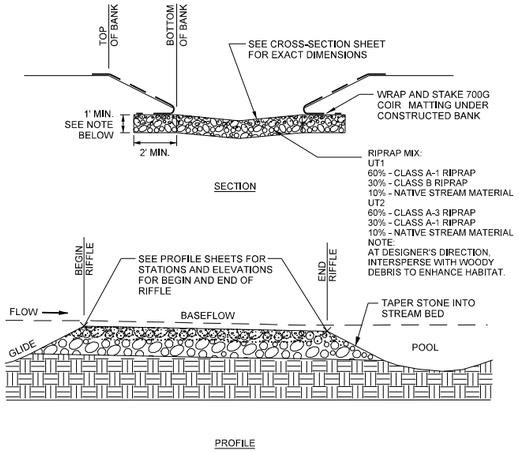
REVISIONS			
	DESCRIPTION	DATE	APPROVED
A	60% DESIGN PLANS	09/2023	
B	60% DESIGN PLANS	02/2024	
C	FINAL CONSTRUCTION PLANS	05/2024	
		SYM.	

KCI TECHNOLOGIES
500 11TH AVE. N. SUITE 290
NASHVILLE, TN 37203

LOCKELAND SPRINGS
STREAM RESTORATION PROJECT
DAVIDSON COUNTY, TENNESSEE

DATE: MAY 2024
SCALE: N.T.S.

GENERAL NOTES

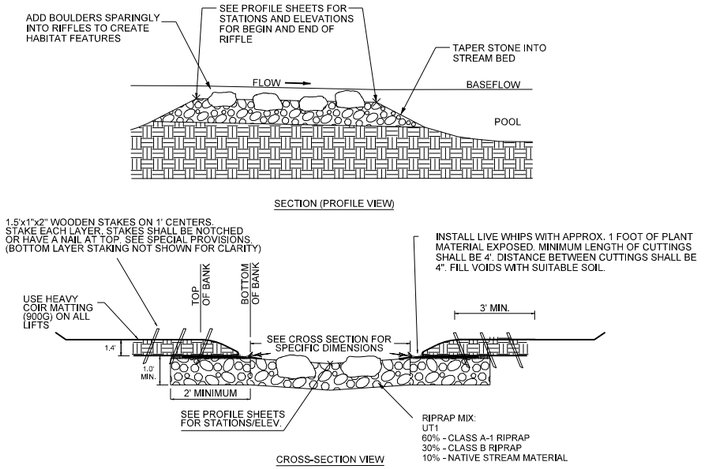


NOTE:

STONE INSTALLATION: START BY INSTALLING STONE MIXTURE. FINISH BY WASHING IN NATURAL STREAM MATERIAL HARVESTED FROM EXISTING STREAM CHANNEL TO FILL VOIDS AND OBTAIN FINAL GRADE.

RIFFLE GRADE CONTROL

SCALE: NTS



CONSTRUCTED RIFFLE WITH SOIL LIFT

SCALE: NTS

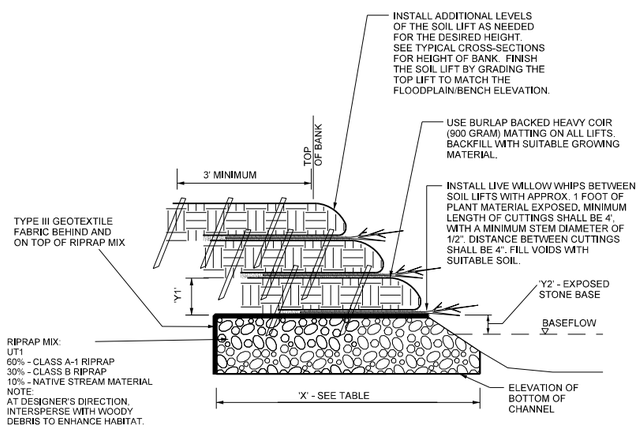
NOTE:

- BEGIN BY INSTALLING CLASS B STONE. THEN ADD A MIX OF NATIVE GRAVEL AND CLASS A-1 TO FILL IN VOIDS AND TO OBTAIN FINAL GRADE. DEPTH OF STONE SHOULD BE 1.0' MINIMUM.

- UT1 SHALL HAVE ONE LIFT AT A HEIGHT OF 1.4'. THE FACE OF THE LIFT WILL BE SLOPED AT 3:1.

- ADD BOULDERS OR LARGER CLASS B STONES SPARINGLY INTO RIFFLES TO CREATE HABITAT FEATURES

- LIVE WHIPS TO BE REPLACED WITH LIVE STAKES IF CONSTRUCTION OCCURS DURING THE SUMMER/EARLY FALL. SEE LIVE STAKE SPACING IN PLANTING PLAN.



COEFFICIENT	UT1	UT2
X	4.0'	3.0'
Y1	1.2'	0.3'
Y2	0.2'	0.1'

NOTES:

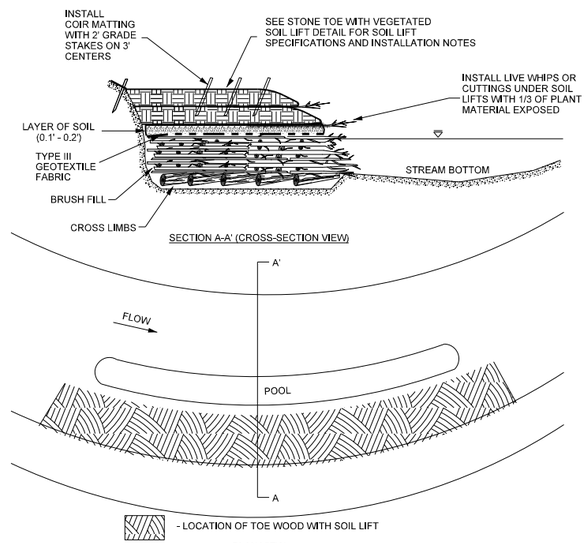
USE 1.5'x1"x2" WOODEN STAKES ON 1' CENTERS. STAKES SHALL HAVE A 'ROOFING' NAIL AT TOP TO KEEP FABRIC FROM SLIPPING OFF.

IF BEDROCK IS ENCOUNTERED DO NOT CUT DEEPER THAN THE EXISTING BEDROCK. IF BEDROCK IS ENCOUNTERED, ADJUST DEPTH OF RIPRAP FOOTER TO COMPENSATE FOR BEDROCK ELEVATION; OR ELIMINATE FOOTER AND BUILD THE FIRST LIFT ON THE BEDROCK AT THE DIRECTION OF THE DESIGNER.

- LIVE WHIPS TO BE REPLACED WITH LIVE STAKES IF CONSTRUCTION OCCURS DURING THE SUMMER/EARLY FALL. SEE LIVE STAKE SPACING IN PLANTING PLAN.

STONE TOE WITH SOIL LIFT

SCALE: NTS



STEP 1 - INSTALL 4" TO 10" CROSS LIMBS ANGLED 30 DEGREES UPSTREAM.

STEP 2 - FILL TOP OF CROSS LIMBS WITH BRUSH INSTALLED IN MULTIPLE DIRECTIONS.

STEP 3 - PLACE FILTER FABRIC OVER THE BRUSH AND ADD A LAYER OF SOIL ON TOP. SOIL LAYER IS APPROX 0.1' - 0.2' HIGH. THEN INSTALL SOIL LIFT.

TOE WOOD WITH SOIL LIFT

SCALE: NTS

NOTE:

- SEE STONE TOE WITH VEGETATED SOIL LIFT DETAIL FOR SOIL LIFT SPECIFICATIONS AND INSTALLATION NOTES

- LIVE WHIPS TO BE REPLACED WITH LIVE STAKES IF CONSTRUCTION OCCURS DURING THE SUMMER/EARLY FALL. SEE LIVE STAKE SPACING IN PLANTING PLAN.

APPROVED:

DATE:

REVISIONS

	DESCRIPTION	DATE	APPROVED
A	60% DESIGN PLANS	09/2023	
B	60% DESIGN PLANS	02/2024	
C	FINAL CONSTRUCTION PLANS	05/2024	

SYM.

TDEC WATER SERVICES

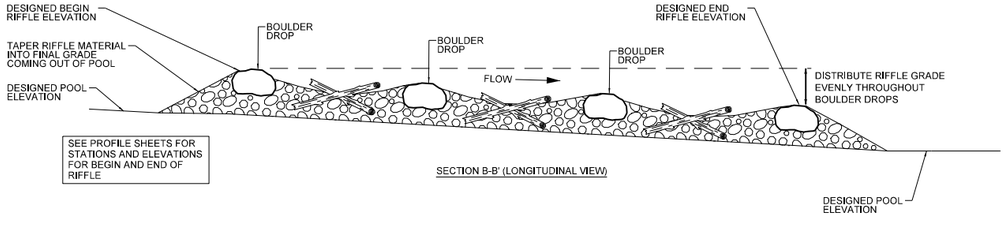
KCI TECHNOLOGIES
500 10TH AVE. N, SUITE 290
NASHVILLE, TN 37203

LOCKELAND SPRINGS
STREAM RESTORATION PROJECT
DAVIDSON COUNTY, TENNESSEE

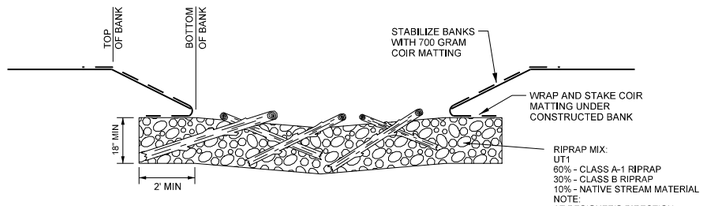
DATE: MAY 2024
SCALE: N.T.S.

DETAILS

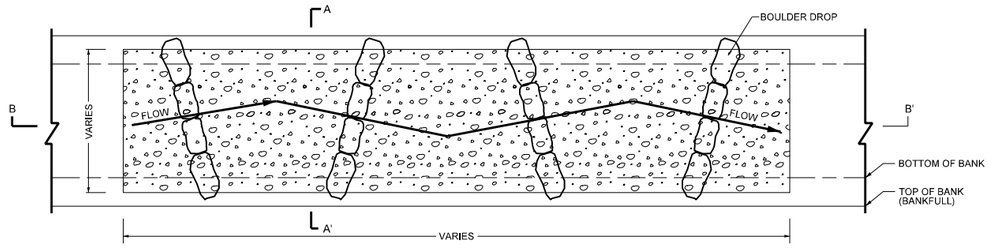
SHEET 3 OF 11



SECTION B-B' (LONGITUDINAL VIEW)



SECTION A-A' (CROSS-SECTION VIEW)



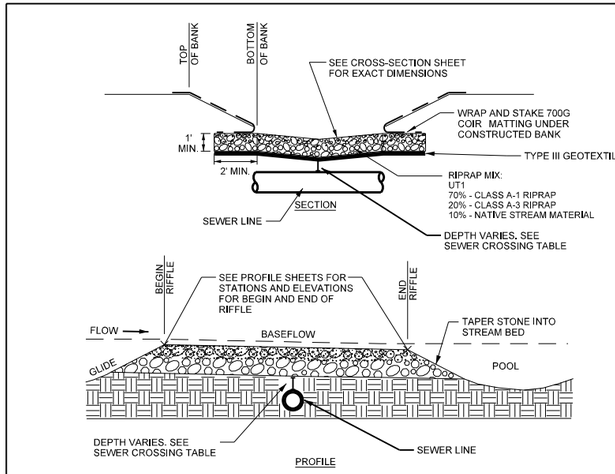
PLAN VIEW

NOTES:
BEGIN BY INSTALLING RIFFLE GRADE CONTROL PER DETAIL. INSTALL BOULDER DROPS AS DEPICTED. BOULDER SIZE SHOULD BE APPROXIMATELY 3' X 2' X 1.5'

SEE CROSS-SECTION SHEET FOR EXACT DIMENSIONS.

MAX DEPTH BETWEEN BOULDER DROPS SHALL BE 0.2'.

CASCADING RIFFLE



PROFILE

CONSTRUCTED RIFFLE WITH GEOTEXTILE

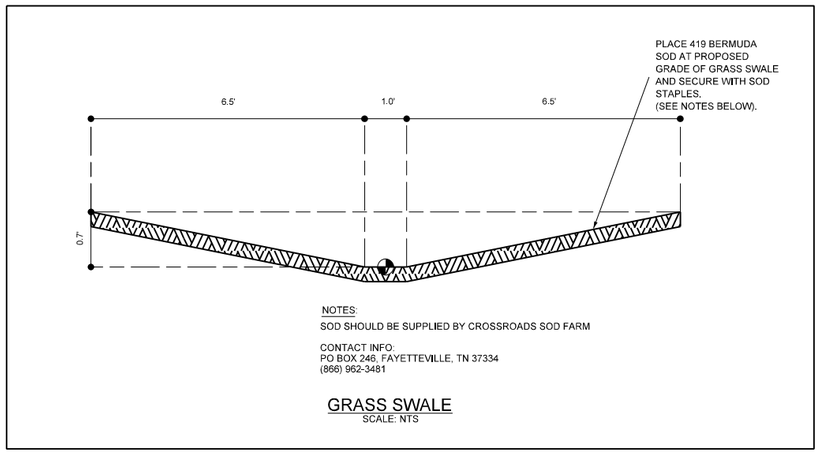
SCALE: NTS

NOTE:

- THIS DETAIL IS FOR ALL CONSTRUCTED RIFFLES THAT CROSS OVER A SEWER LINE. INSTALL TYPE III GEOTEXTILE ABOVE SEWER LINE AND THEN OVERLAY WITH THE STONE MIX.

- TEST PITS SHOULD BE DUG PRIOR TO CONSTRUCTION TO DETERMINE EXACT LOCATION OF THE SEWER LINE. CONTRACTOR SHALL NOTIFY THE DESIGNER AND OWNER OF ANY CONFLICTS PRIOR TO CONSTRUCTING THE RIFFLE.

- THE STONE MIX WILL BE A MIX OF 70% CLASS A-1 RIPRAP, 20% CLASS A-3 RIPRAP, AND 10% NATIVE STREAM MATERIAL. BEGIN BY INSTALLING CLASS A-1 STONE. THEN ADD A MIX OF NATIVE MATERIAL AND CLASS A-3 TO FILL IN VOIDS AND TO OBTAIN FINAL GRADE. DEPTH OF STONE SHOULD BE VARIBALE DEPENDING ON THE DEPTH OF THE SEWER LINE.

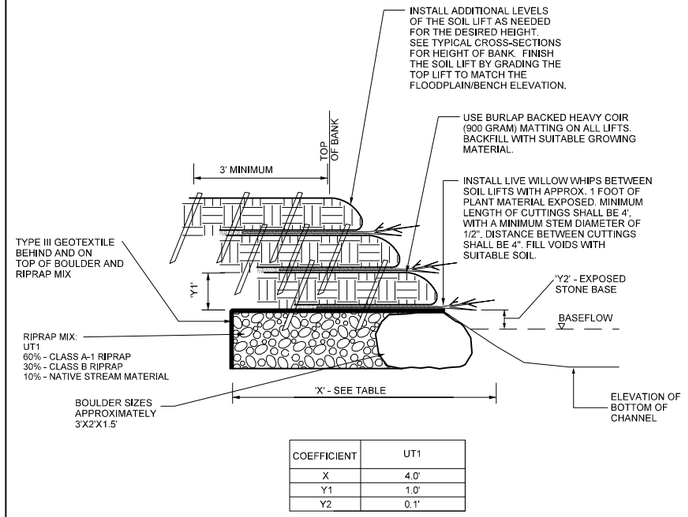


NOTES:
SOD SHOULD BE SUPPLIED BY CROSSROADS SOD FARM

CONTACT INFO:
PO BOX 246, FAYETTEVILLE, TN 37334
(866) 962-3481

GRASS SWALE

SCALE: NTS



COEFFICIENT	UT1
X	4.0'
Y1	1.0'
Y2	0.1'

NOTES:
USE 1.5"x1"x2" WOODEN STAKES ON 1' CENTERS. STAKES SHALL HAVE A 'ROOFING' NAIL AT TOP TO KEEP FABRIC FROM SLIPPING OFF.

IF BEDROCK IS ENCOUNTERED DO NOT CUT DEEPER THAN THE EXISTING BEDROCK. IF BEDROCK IS ENCOUNTERED, ADJUST DEPTH OF RIPRAP FOOTER TO COMPENSATE FOR BEDROCK ELEVATION; OR ELIMINATE FOOTER AND BUILD THE FIRST LIFT ON THE BEDROCK AT THE DIRECTION OF THE DESIGNER.

LIVE WHIPS TO BE REPLACED WITH LIVE STAKES IF CONSTRUCTION OCCURS DURING THE SUMMER/EARLY FALL. SEE LIVE STAKE SPACING IN PLANTING PLAN.

BOULDER TOE W/ VEGETATED SOIL LIFT

SCALE: NTS

APPROVED:

DATE:

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REVISIONS

METRO WATER SERVICES

KCI TECHNOLOGIES
500 10TH AVE. N, SUITE 290
NASHVILLE, TN 37203

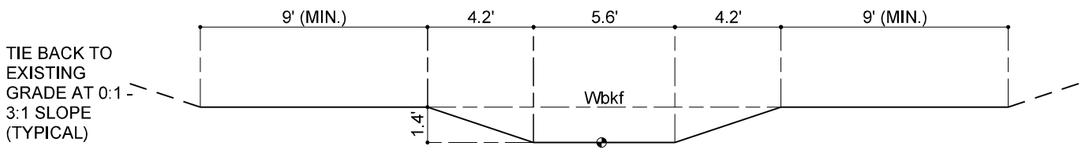
LOCKELAND SPRINGS
STREAM RESTORATION PROJECT
DAVIDSON COUNTY, TENNESSEE

DATE: MAY 2024
SCALE: N.T.S.

DETAILS

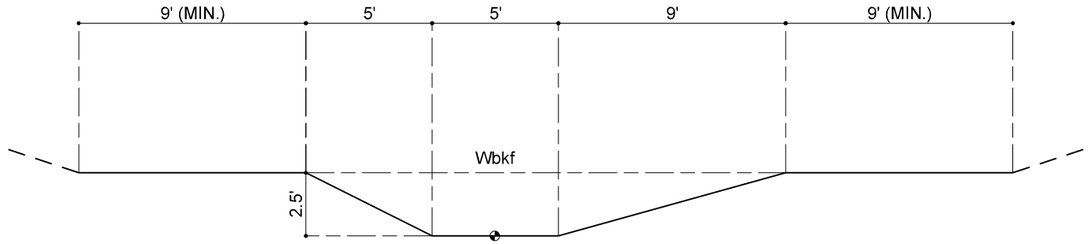
SHEET 4 OF 11

LOCKELAND SPRINGS
TYPICAL CROSS-SECTIONS - UT1 REACH 1
RIFFLE & POOL



◔ = THALWEG LOCATION

TYPICAL RIFFLE

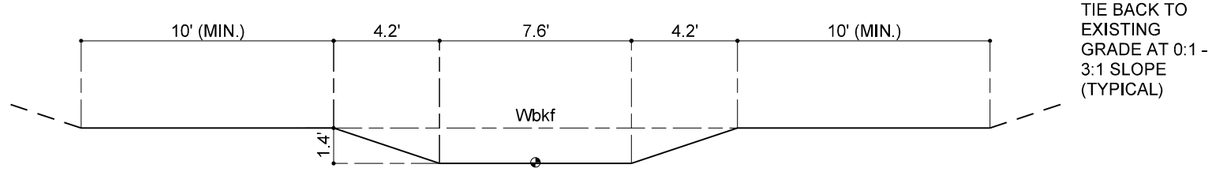


◔ = THALWEG LOCATION

TYPICAL POOL - LEFT MEANDER

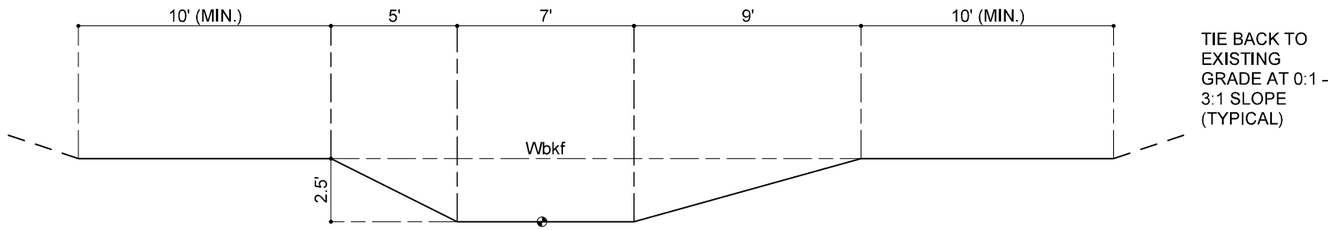
NOTE: MIRROR SECTION FOR RIGHT MEANDERS

LOCKELAND SPRINGS
CROSS-SECTIONS - UT1 REACH 2
RIFFLE & POOL



◔ = THALWEG LOCATION

TYPICAL RIFFLE

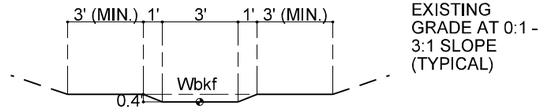


◔ = THALWEG LOCATION

TYPICAL POOL - LEFT MEANDER

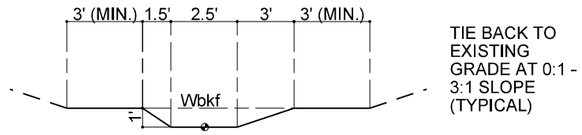
NOTE: MIRROR SECTION FOR RIGHT MEANDERS

LOCKELAND SPRINGS
TYPICAL CROSS-SECTIONS - UT2
RIFFLE & POOL



◔ = THALWEG LOCATION

TYPICAL RIFFLE

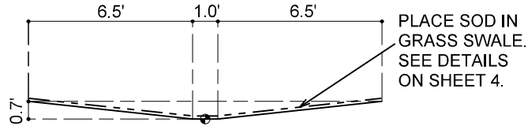


◔ = THALWEG LOCATION

TYPICAL POOL - LEFT MEANDER

NOTE: MIRROR SECTION FOR RIGHT MEANDERS

LOCKELAND SPRINGS
TYPICAL CROSS-SECTIONS - GRASS SWALE



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KCI TECHNOLOGIES
500 10TH AVE. N. SUITE 290
NASHVILLE, TN 37203

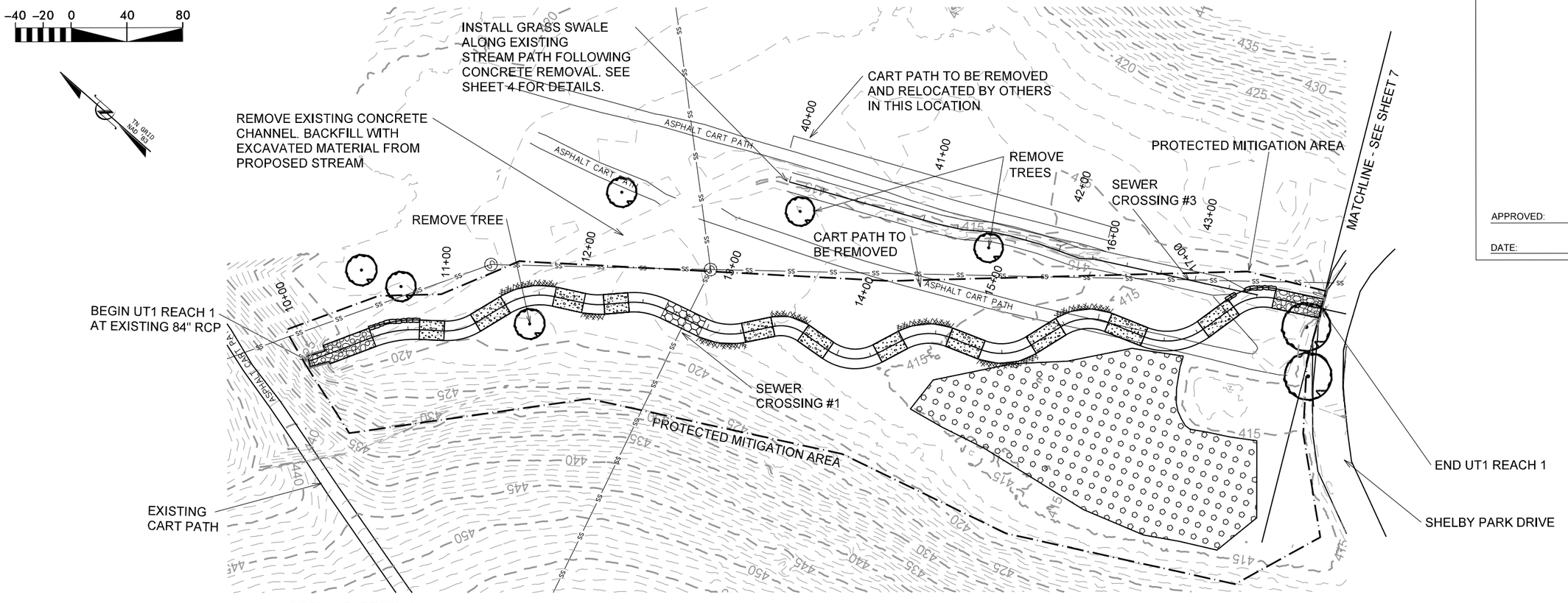
LOCKELAND SPRINGS
STREAM RESTORATION PROJECT

DAVIDSON COUNTY, TENNESSEE

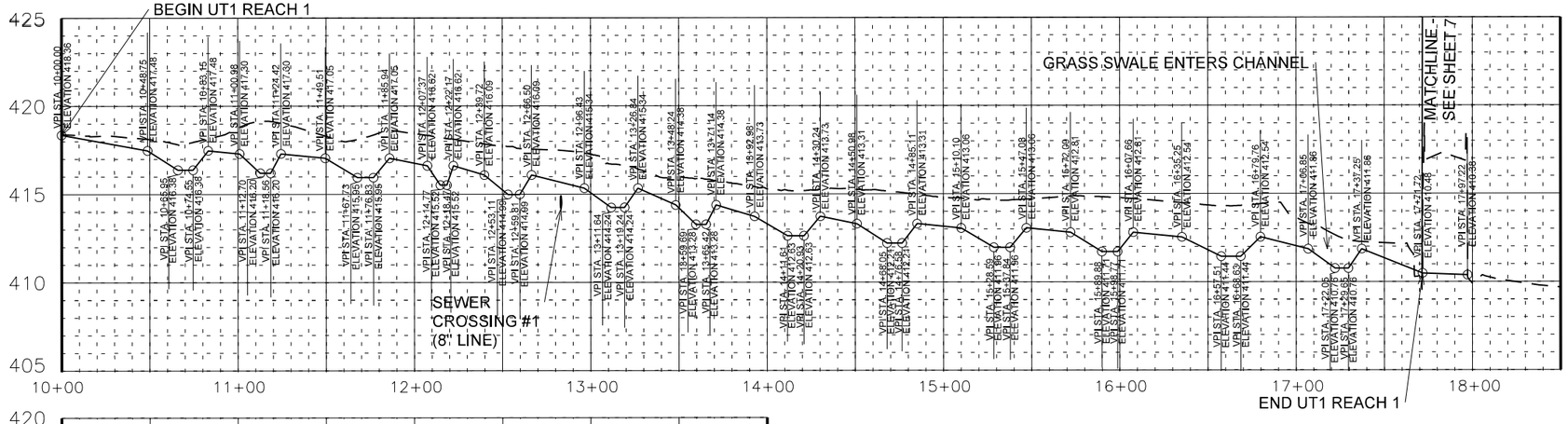
DATE: MAY 2024

SCALE: GRAPHIC

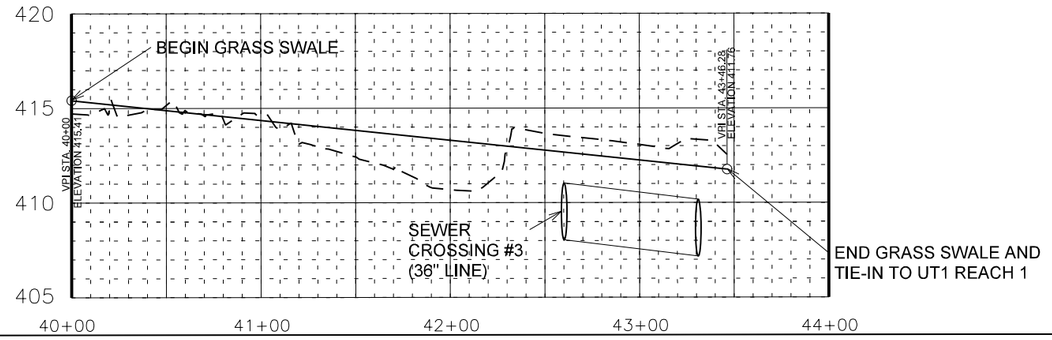
TYPICAL CROSS-SECTIONS



UT1 REACH 1 PROFILE



GRASS SWALE PROFILE



APPROVED:

DATE:

	DESCRIPTION	DATE	APPROVED
A	60% DESIGN PLANS	09/2023	
B	60% DESIGN PLANS	02/2024	
C	FINAL CONSTRUCTION PLANS	05/2024	

REVISIONS

NASHVILLE WATER SERVICES

KCI TECHNOLOGIES
500 11TH AVE. N. SUITE 290
NASHVILLE, TN 37203

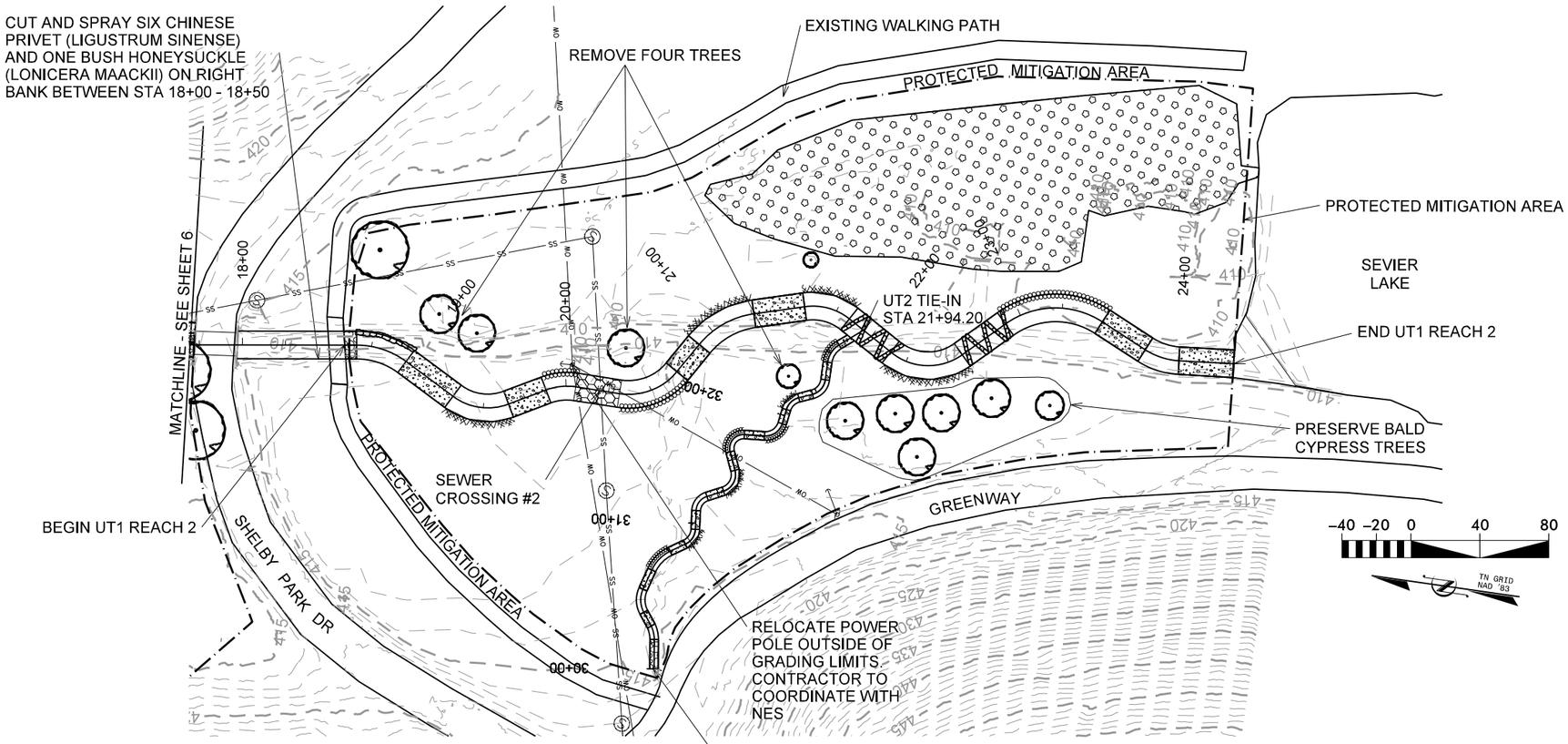
LOCKELAND SPRINGS STREAM RESTORATION PROJECT

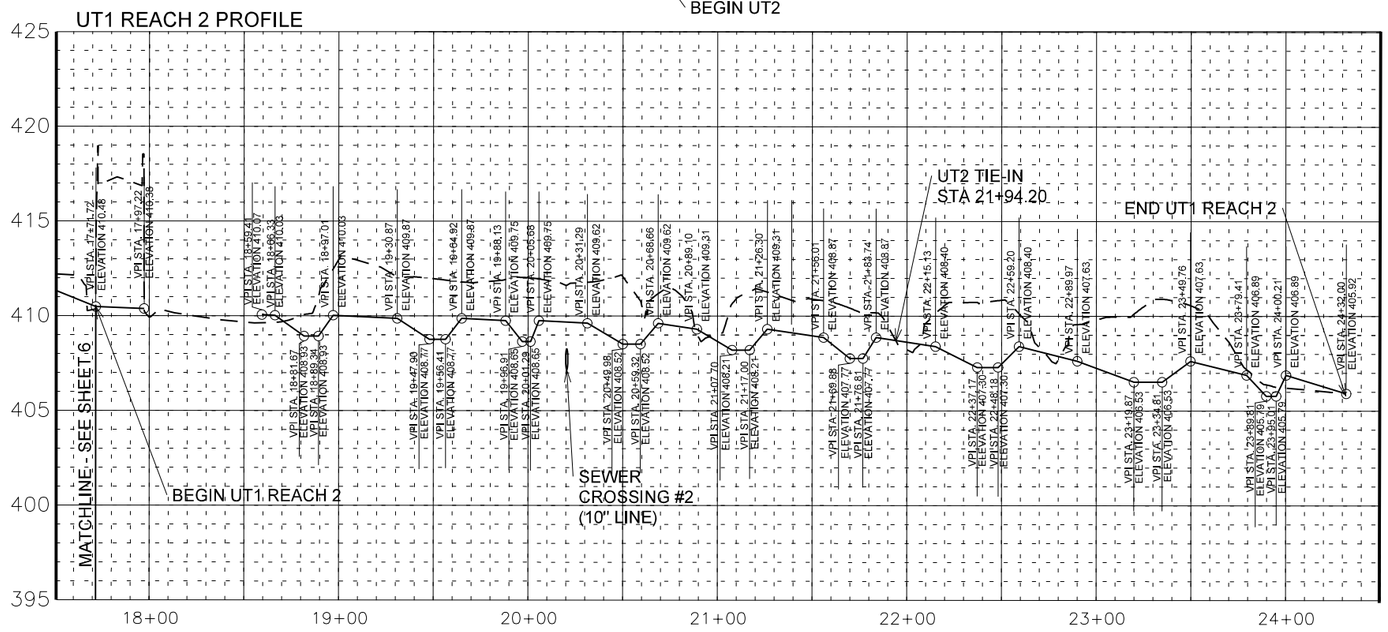
DAVIDSON COUNTY, TENNESSEE

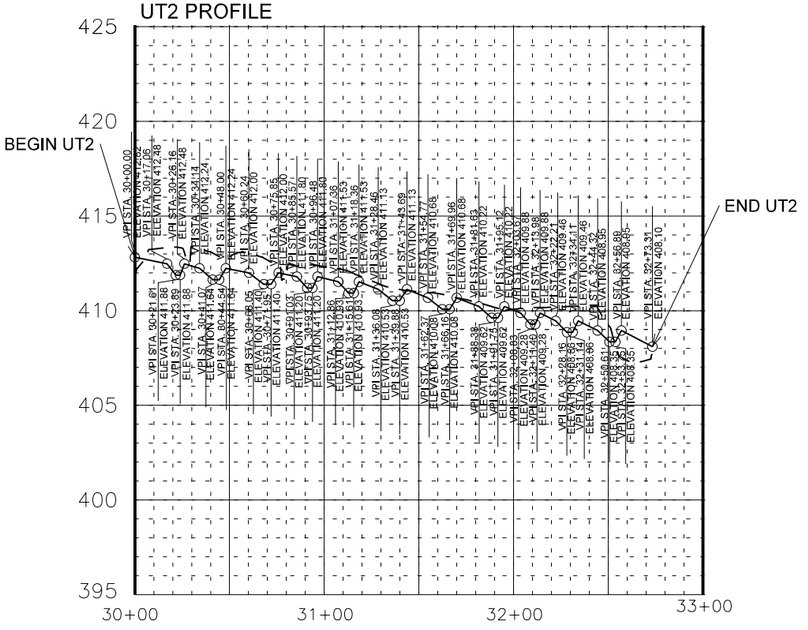
DATE: MAY 2024
SCALE: GRAPHIC

PLAN AND PROFILE

SHEET 6 OF 11







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REVISIONS

NES WATER SERVICES

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NASHVILLE, TN 37203

LOCKELAND SPRINGS STREAM RESTORATION PROJECT

DAVIDSON COUNTY, TENNESSEE

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PLAN AND PROFILE

SHEET 7 OF 11

NOTE: PLANTING TO OCCUR DURING DORMANCY. ANY TREE SUBSTITUTIONS WILL BE APPROVED BY THE DESIGNER AND BE NATIVE SPECIES APPROPRIATE FOR THESE HABITAT TYPES

PLANTING ZONE 1:

PLANTING ZONE 1 (STREAM ZONE)
LIVE STAKES: 1.5' TO 2' LENGTHS, 1/2' TO 2" DIAMETER,
PLANT STAGGERED ROWS AT 3' x 3' SPACING, RANDOM SPECIES PLACEMENT.

	COMMON NAME	SCIENTIFIC NAME	STRATUM	INDICATOR STATUS	TWO ROWS STAGGERED SPACING(FT)	PLANTING TYPE	LINEAR DENSITY (STEMS/100 FT)	TOTAL LENGTH (FT)	TOTAL STEMS
ZONE 1	BLACK WILLOW	*SALIX NIGRA*	MIDSTORY	OBL	3x3	LIVE STAKE	133.3	1670	2227
	SILKY WILLOW	*SALIX SERICEA*	UNDERSTORY	OBL	3x3	LIVE STAKE	133.3	1670	
	SILKY DOGWOOD	*CORNUS AMOMUM*	UNDERSTORY	FACW	3x3	LIVE STAKE	133.3	1670	
	BUTTONBUSH	*CEPHALANTHUS OCCIDENTALIS*	UNDERSTORY	OBL	3x3	LIVE STAKE	133.3	1670	

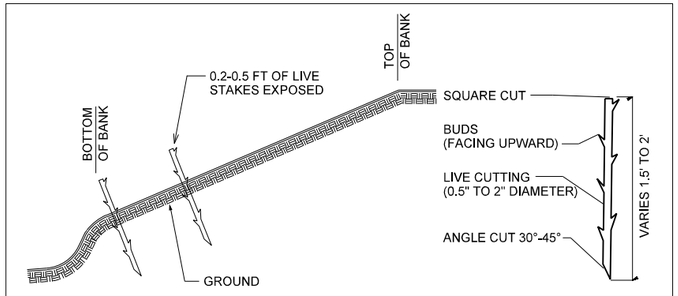
NOTE: NO SINGLE LIVE STAKING SPECIES SHALL COMPOSE MORE THAN 40% OF THE TOTAL NUMBER OF LIVE STAKES TO BE INSTALLED. LIVE STAKES SHALL BE PLANTED IN TWO STAGGERED ROWS ON EACH BANK. TOTAL LIVE STAKE STEMS COULD INCREASE IF LIVE WHIPS ARE NOT INSTALLED DUE TO CONSTRUCTION SCHEDULE. SEE DETAILS SHEETS.

PLANTING ZONE 2:

PLANTING ZONE 2 = 2.74 ACRES

12" - 18" BARE ROOT MATERIAL
968 STEMS/ACRE (9' X 5' SPACING), RANDOM SPECIES PLACEMENT

	COMMON NAME	SCIENTIFIC NAME	STRATUM	INDICATOR STATUS	SPACING (FT)	PLANTING TYPE	DENSITY (STEMS/ACRE)	AREA (ACRES)	COMPOSITION (%)	TOTAL STEMS
ZONE 2	TULIP POPLAR	*LIRIODENDRON TULIPIFERA*	OVERSTORY	FAC	9x5	BARE ROOT	968	2.74	7%	186
	NORTHERN RED OAK	*QUERCUS RUBRA*	OVERSTORY	FACU	9x5	BARE ROOT	968	2.74	5%	133
	WILLOW OAK	*QUERCUS PHELLOS*	OVERSTORY	FAC	9x5	BARE ROOT	968	2.74	6%	159
	AMERICAN HORNBEAM	*CARPINUS CAROLINIANA*	MIDSTORY	FAC	9x5	BARE ROOT	968	2.74	7%	186
	SYCAMORE	*PLATANUS OCCIDENTALIS*	OVERSTORY	FAC	9X5	BARE ROOT	968	2.74	10%	265
	AMERICAN PERSIMMON	*DIOSPYROS VIRGINIANA*	OVERSTORY	FAC	9x5	BARE ROOT	968	2.74	7%	186
	PIN OAK	*QUERCUS PALUSTRIS*	OVERSTORY	FACW	9x5	BARE ROOT	968	2.74	6%	159
	WINTERBERRY	*ILEX VERTICILLATA*	UNDERSTORY	FACW	9x5	BARE ROOT	968	2.74	13%	345
	SPICEBUSH	*LINDERA BENZOIN*	UNDERSTORY	FAC	9x5	BARE ROOT	968	2.74	13%	345
	AMERICAN HAZELNUT	*CORYLUS AMERICANA*	UNDERSTORY	FACU	9X5	BARE ROOT	968	2.74	13%	345
	WILD HYDRANGEA	*HYDRANGEA ARBORESCENS*	UNDERSTORY	FACU	9x5	BARE ROOT	968	2.74	13%	345



PLANTING NOTES:

RIFFLES - 2 ROWS OF LIVE STAKES ON BOTH SIDES OF CHANNEL.
POOLS - 2 ROWS OF LIVE STAKES ON BOTH SIDES OF CHANNEL.

LIVE STAKES
SCALE: NTS

PLANTING ZONE 3 (WETLAND ZONE):

PLANTING ZONE 3 = 0.99 ACRES

12" - 18" BARE ROOT MATERIAL
968 STEMS/ACRE (9' X 5' SPACING), RANDOM SPECIES PLACEMENT

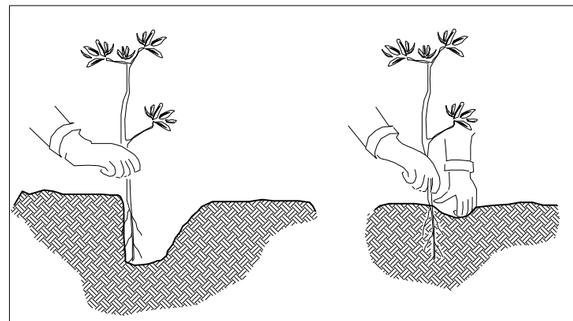
	COMMON NAME	SCIENTIFIC NAME	STRATUM	INDICATOR STATUS	SPACING (FT)	PLANTING TYPE	DENSITY (STEMS/ACRE)	AREA (ACRES)	COMPOSITION (%)	TOTAL STEMS
ZONE 3	BUTTONBUSH	*CEPHALANTHUS OCCIDENTALIS*	UNDERSTORY	OBL	9x5	BARE ROOT	968	0.99	25%	240
	NINEBARK	*PHYSOCARPUS OPULIFOLIUS*	UNDERSTORY	FACW	9x5	BARE ROOT	968	0.99	25%	240
	WINTERBERRY	*ILEX VERTICILLATA*	UNDERSTORY	FACW	9x5	BARE ROOT	968	0.99	25%	240
	TAG ALDER	*ALNUS SERRULATA*	UNDERSTORY	FACW	9x5	BARE ROOT	968	0.99	25%	240

PLANTING ZONE 4 (SHRUB ONLY ZONE):

PLANTING ZONE 4 = 0.62 ACRES

12" - 18" BARE ROOT MATERIAL
968 STEMS/ACRE (9' X 5' SPACING), RANDOM SPECIES PLACEMENT

	COMMON NAME	SCIENTIFIC NAME	STRATUM	INDICATOR STATUS	SPACING (FT)	PLANTING TYPE	DENSITY (STEMS/ACRE)	AREA (ACRES)	COMPOSITION (%)	TOTAL STEMS
ZONE 4	WINTERBERRY	*ILEX VERTICILLATA*	UNDERSTORY	FACW	9x5	BARE ROOT	968	0.71	25%	172
	SPICEBUSH	*LINDERA BENZOIN*	UNDERSTORY	FAC	9x5	BARE ROOT	968	0.71	25%	172
	AMERICAN HAZELNUT	*CORYLUS AMERICANA*	UNDERSTORY	FACU	9X5	BARE ROOT	968	0.71	25%	172
	WILD HYDRANGEA	*HYDRANGEA ARBORESCENS*	UNDERSTORY	FACU	9x5	BARE ROOT	968	0.71	25%	172



PLANTING OF BARE ROOT SEEDLING
SCALE: NTS

APPROVED:

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REVISIONS

APPROVED

NASHVILLE WATER SERVICES

KCI TECHNOLOGIES
500 11TH AVE. N, SUITE 290
NASHVILLE, TN 37203

LOCKELAND SPRINGS
STREAM RESTORATION PROJECT
DAVIDSON COUNTY, TENNESSEE

DATE: MAY 2024
SCALE: N.T.S.

PLANTING PLAN

PLANTING PLAN LEGEND

ZONE 1

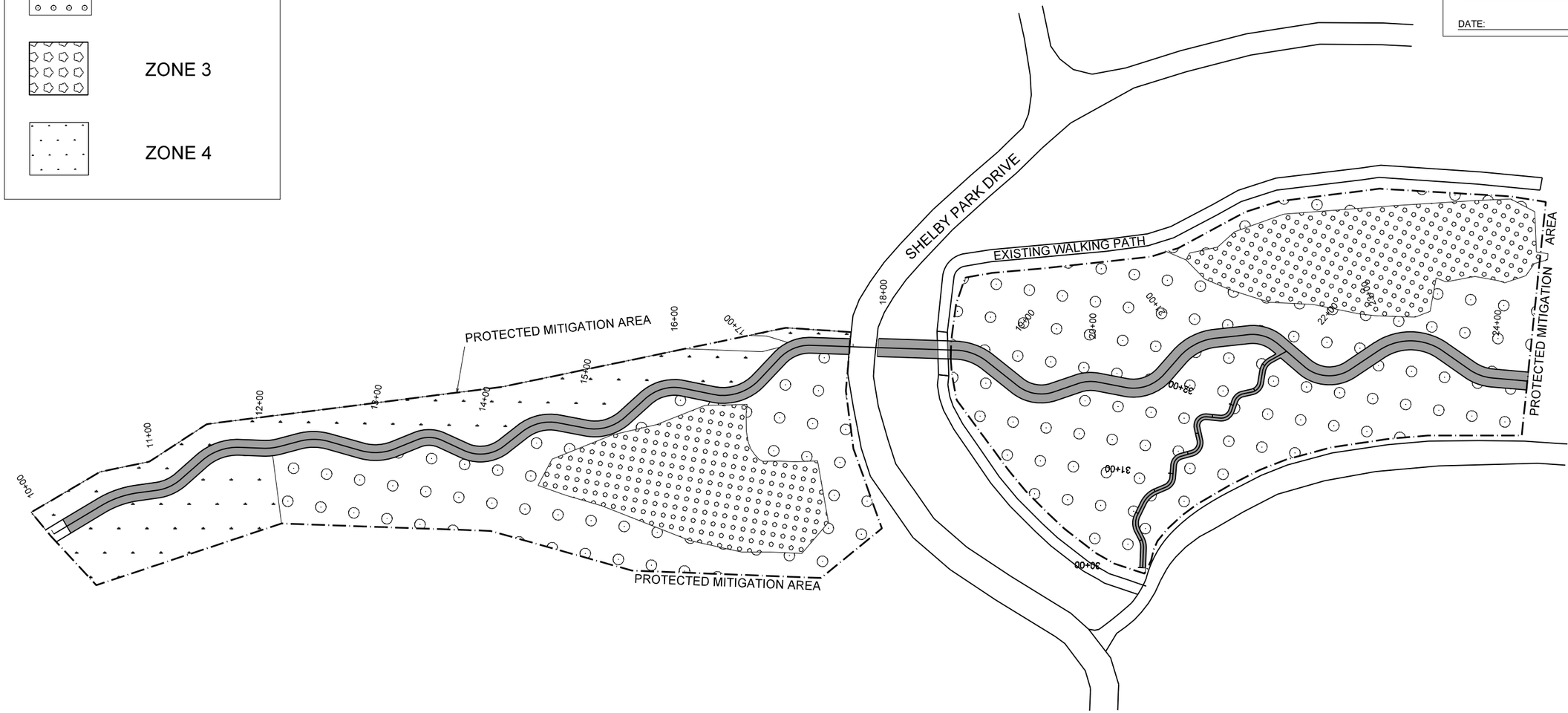
ZONE 2

ZONE 3

ZONE 4

–50 –25 0 50 100

TN GRID
NAD '83



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SYM. REVISIONS

METRO WATER SERVICES

KCI TECHNOLOGIES
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NASHVILLE, TN 37203

LOCKELAND SPRINGS STREAM RESTORATION PROJECT

DAVIDSON COUNTY, TENNESSEE

DATE: MAY 2024

SCALE: GRAPHIC

PLANTING PLAN

UT1 REACH 1 GEOMETRY										
FEATURE	LENGTH	BEARING	RADIUS	STATION	NORTHING	EASTING	CURVE CENTER NORTHING	CURVE CENTER EASTING	CURVE CENTER DELTA/THETA	CURVE CENTER ROTATION
POB	48.75	S 40°59'24" E		10+00.00	671073.7412	1752420.2743				
PC	34.41	S 29°23'39" E	85	10+48.75	671036.9453	1752452.2493	670981.1914	1752388.089	23°11'30"	Right
PT	17.83	S 17°47'55" E		10+83.15	671007.1734	1752469.0210				
PC	23.44	S 34°35'04" E	40	11+00.99	670990.1948	1752474.4717	671002.4216	1752512.557	33°34'19"	Left
PT	25.09	S 51°22'14" E		11+24.42	670971.1736	1752487.5859				
PC	36.42	S 29°37'58" E	48	11+49.52	670955.5077	1752507.1896	670918.0101	1752477.224	43°28'31"	Right
PT	21.43	S 7°53'42" E		11+85.94	670924.6034	1752524.7691				
PC	14.81	S 16°22'42" E	50	12+07.37	670903.3784	1752527.7125	670910.2463	1752577.239	16°57'59"	Left
PT	17.55	S 24°51'41" E		12+22.17	670889.2251	1752531.8722				
PC	26.77	S 9°31'22" E	50	12+39.73	670873.2990	1752539.2518	670852.2777	1752493.885	30°40'39"	Right
PT	29.93	S 5°48'58" W		12+66.50	670847.2110	1752543.6281				
PC	30.42	S 13°07'43" E	46	12+96.42	670817.4391	1752540.5955	670812.7776	1752586.359	37°53'22"	Left
PT	21.40	S 32°04'24" E		13+26.84	670788.3515	1752547.3797				
PC	22.89	S 8°39'01" E	28	13+48.24	670770.2159	1752558.7443	670755.3478	1752535.018	46°50'46"	Right
PT	21.84	S 14°46'22" W		13+71.14	670748.2082	1752562.0924				
PC	37.27	S 16°37'44" E	34	13+92.97	670727.0950	1752556.5248	670718.4254	1752589.401	62°48'12"	Left
PT	20.74	S 48°01'50" E		14+30.24	670693.1463	1752566.6640				
PC	34.13	S 23°35'01" E	40	14+50.98	670679.2797	1752582.0811	670649.5395	1752555.332	48°53'40"	Right
PT	24.99	S 0°51'49" W		14+85.11	670648.9366	1752595.3273				
PC	36.98	S 25°37'19" E	40	15+10.10	670623.9510	1752594.9506	670623.348	1752634.946	52°58'17"	Left
PT	25.01	S 52°06'27" E		15+47.08	670591.7814	1752610.3788				
PC	35.56	S 25°17'51" E	38	15+72.09	670576.4194	1752630.1175	670546.4312	1752606.779	53°37'13"	Right
PT	27.59	S 1°30'46" W		16+07.66	670545.4280	1752644.7654				
PC	44.51	S 27°28'08" E	44	16+35.25	670517.8466	1752644.0370	670516.6851	1752688.022	57°57'47"	Left
PT	27.09	S 56°27'01" E		16+79.76	670480.0152	1752663.7046				
PC	30.40	S 32°15'29" E	36	17+06.85	670465.0456	1752686.2786	670435.043	1752666.383	48°23'05"	Right
PT	34.47	S 8°03'56" E		17+37.25	670440.0940	1752702.0268				
POE	0.00	0	0	17+71.72	670405.9601	1752706.8639	0	0	0	0

UT1 REACH 2 GEOMETRY										
FEATURE	LENGTH	BEARING	RADIUS	STATION	NORTHING	EASTING	CURVE CENTER NORTHING	CURVE CENTER EASTING	CURVE CENTER DELTA/THETA	CURVE CENTER ROTATION
POB	94.61	S 8°03'56" E		17+71.72	670380.7126	1752710.4417				
PC	30.68	S 10°14'41" W	48	18+66.33	670312.2822	1752720.1390	670305.5474	1752672.614	36°37'15"	Right
PT	33.86	S 28°33'19" W		18+97.01	670282.6031	1752714.7749				
PC	34.05	S 0°08'00" E	34	19+30.87	670252.8615	1752698.5893	670236.6092	1752728.453	57°22'39"	Left
PT	23.21	S 28°49'20" E		19+64.92	670220.2181	1752698.6654				
PC	17.55	S 14°02'20" E	34	19+88.13	670199.8814	1752709.8558	670183.4902	1752680.068	29°33'59"	Right
PT	25.61	S 0°44'39" W		20+05.68	670183.0486	1752714.0649				
PC	37.37	S 28°59'39" E	36	20+31.29	670157.4391	1752713.7322	670156.9715	1752749.729	59°28'37"	Left
PT	20.44	S 58°43'58" E		20+68.66	670126.2003	1752731.0440				
PC	37.20	S 37°25'09" E	50	20+89.10	670115.5898	1752748.5177	670072.852	1752722.566	42°37'38"	Right
PT	29.71	S 16°06'20" E		21+26.30	670086.7224	1752770.6038				
PC	27.73	S 7°15'27" W	34	21+56.02	670058.1753	1752778.8465	670048.7434	1752746.181	46°43'33"	Right
PT	31.39	S 30°37'13" W		21+83.74	670031.4256	1752775.4400				
PC	44.06	S 6°30'25" E	34	22+15.14	670004.4117	1752759.4511	669987.094	1752788.71	74°15'16"	Left
PT	30.77	S 43°38'03" E		22+59.20	669963.6323	1752764.1023				
PC	59.80	S 9°22'24" E	50	22+89.97	669941.3648	1752785.3326	669906.8623	1752749.145	68°31'17"	Right
PT	29.65	S 24°53'15" W		23+49.76	669885.8205	1752794.5014				
PC	20.80	S 9°59'22" W	40	23+79.41	669858.9249	1752782.0241	669842.0915	1752818.31	29°47'45"	Left
PT	31.79	S 4°54'30" E		24+00.21	669838.6689	1752778.4562				
POE	0.00	0	0	24+32.00	669806.9963	1752781.1762	0	0	0	0

UT2 GEOMETRY										
FEATURE	LENGTH	BEARING	RADIUS	STATION	NORTHING	EASTING	CURVE CENTER NORTHING	CURVE CENTER EASTING	CURVE CENTER DELTA/THETA	CURVE CENTER ROTATION
POB	17.06	N 82.2981 E		30+00.00	670115.0690	1752558.6030				
PC	9.10	N 67.8170 E	18	30+17.06	670117.3555	1752575.5101	670135.1931	1752573.098	28.9621	Left
PT	7.98	N 53.3360 E		30+26.16	670120.7544	1752583.8460				
PC	13.86	N 79.8020 E	15	30+34.14	670125.5202	1752590.2481	670113.4879	1752599.205	52.9321	Right
PT	12.24	S 73.7319 E		30+48.00	670127.8873	1752603.4069				
PC	15.60	S 53.4124 E	22	30+60.24	670124.4578	1752615.1591	670103.3387	1752608.996	40.6391	Right
PT	9.72	S 33.0928 E		30+75.85	670115.3506	1752627.4275				
PC	10.92	S 64.3872 E	10	30+85.56	670107.2107	1752632.7324	670112.6707	1752641.11	62.5887	Left
PT	10.88	N 84.3185 E		30+96.48	670102.7198	1752642.1002				
PC	11.00	S 60.6614 E	9	31+07.36	670103.7968	1752652.9248	670094.841	1752653.816	70.0402	Right
PT	10.10	S 25.6413 E		31+18.36	670098.7356	1752661.9295				
PC	15.23	S 69.2658 E	10	31+28.46	670089.6332	1752666.2987	670093.9605	1752675.314	87.2489	Left
PT	11.08	N 67.1097 E		31+43.69	670084.7480	1752679.2036				
PC	15.18	S 58.5144 E	8	31+54.77	670089.0586	1752689.4131	670081.6886	1752692.525	108.7516	Right
PT	11.67	S 4.1386 E		31+69.96	670082.2660	1752700.5039				
PC	13.50	S 42.8093 E	10	31+81.62	670070.6292	1752701.3460	670071.3509	1752711.32	77.3412	Left
PT	8.55	S 81.4799 E		31+95.12	670061.4613	1752709.8383				
PC	10.32	S 51.9292 E	10	32+03.67	670060.1950	1752718.2911	670050.3053	1752716.81	59.1014	Right
PT	8.23	S 22.3785 E		32+13.98	670054.1125	1752726.0565				
PC	11.89	S 56.4493 E	10	32+22.21	670046.5037	1752729.1893	670050.311	1752738.436	68.1416	Left
PT	10.21	N 89.4799 E		32+34.11	670040.3114	1752738.5269				
PC	12.58	S 64.7792 E	14	32+44.31	670040.4040	1752748.7353	670026.4046	1752748.862	51.4817	Right
PT	16.42	S 39.0383 E		32+56.89	670035.2224	1752759.7365				
POE	0.00	0	0	32+73.32	670022.4661	1752770.0805	0	0	0	0

APPROVED:

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REVISIONS			
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STREAM RESTORATION PROJECT
DAVIDSON COUNTY, TENNESSEE

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GEOMETRY TABLES

UT1 REACH 1 STRUCTURES								
TREATMENT	BEGIN STATION	THALWEG EL.	TOB EL.	END STATION	LENGTH	THALWEG EL.	TOB EL.	BANK
Constructed Riffle w/ S.L.	10+00.00	418.36	419.76	10+48.75	+48.75	417.48	418.88	
Boulder Toe w/ Veg. S.L.	10+48.75	416.38	418.88	10+83.15	+34.40	416.38	418.88	Left
Riffle Grade Control	10+83.15	417.48	418.88	11+00.99	+17.84	417.30	418.70	
Pool	11+00.99	416.20	418.70	11+24.42	+23.43	416.20	418.70	Right
Riffle Grade Control	11+24.42	417.30	418.70	11+49.52	+25.10	417.05	418.45	
Toe Wood w/ S.L.	11+49.52	415.95	418.45	11+85.94	+36.42	415.95	418.45	Left
Riffle Grade Control	11+85.94	417.05	418.45	12+07.37	+21.43	416.62	418.02	
Toe Wood w/ S.L.	12+07.37	415.52	418.02	12+22.17	+14.80	415.52	418.02	Right
Riffle Grade Control	12+22.17	416.62	418.02	12+39.73	+17.56	416.09	417.49	
Pool	12+39.73	414.99	417.49	12+66.50	+26.77	414.99	417.49	Left
Constructed Riffle w/ Liner	12+66.50	416.09	417.49	12+96.42	+29.92	415.34	416.74	
Toe Wood w/ S.L.	12+96.42	414.24	416.74	13+26.84	+30.42	414.24	416.74	Right
Riffle Grade Control	13+26.84	415.34	416.74	13+48.24	+21.40	414.38	415.78	
Toe Wood w/ S.L.	13+48.24	413.28	415.78	13+71.14	+22.90	413.28	415.78	Left
Riffle Grade Control	13+71.14	414.38	415.78	13+92.97	+21.83	413.73	415.13	
Pool	13+92.97	412.63	415.13	14+30.24	+37.27	412.63	415.13	Right
Riffle Grade Control	14+30.24	413.73	415.13	14+50.98	+20.74	413.31	414.71	
Toe Wood w/ S.L.	14+50.98	412.21	414.71	14+85.11	+34.13	412.21	414.71	Left
Riffle Grade Control	14+85.11	413.31	414.71	15+10.10	+24.99	413.06	414.46	
Toe Wood w/ S.L.	15+10.10	411.96	414.46	15+47.08	+36.98	411.96	414.46	Right
Riffle Grade Control	15+47.08	413.06	414.46	15+72.09	+25.01	412.81	414.21	
Toe Wood w/ S.L.	15+72.09	411.71	414.21	16+07.66	+35.57	411.71	414.21	Left
Riffle Grade Control	16+07.66	412.81	414.21	16+35.25	+27.59	412.54	413.94	
Pool	16+35.25	411.44	413.94	16+79.76	+44.51	411.44	413.94	Right
Riffle Grade Control	16+79.76	412.54	413.94	17+06.85	+27.09	411.86	413.26	
Boulder Toe w/ Veg. S.L.	17+06.85	410.76	413.26	17+37.25	+30.40	410.76	413.26	Left
Constructed Riffle w/ S.L.	17+37.25	411.86	413.26	17+71.72	+34.47	410.48	411.88	

UT1 REACH 2 STRUCTURES								
TREATMENT	BEGIN STATION	THALWEG EL.	TOB EL.	END STATION	LENGTH	THALWEG EL.	TOB EL.	BANK
Constructed Riffle w/ S.L.	18+59.41	410.07	411.47	18+66.33	+06.92	410.03	411.43	
Boulder Toe w/ Veg. S.L.	18+66.33	408.93	411.43	18+97.01	+30.68	408.93	411.43	Left
Riffle Grade Control	18+97.01	410.03	411.43	19+30.87	+33.86	409.87	411.27	
Toe Wood w/ S.L.	19+30.87	408.77	411.27	19+64.92	+34.05	408.77	411.27	Right
Riffle Grade Control	19+64.92	409.87	411.27	19+88.13	+23.21	409.75	411.15	
Stone Toe w/ Veg. S.L.	19+88.13	408.65	411.15	20+05.68	+17.55	408.65	411.15	Left
Constructed Riffle w/ Liner	20+05.68	409.75	411.15	20+31.29	+25.61	409.62	411.02	
Stone Toe w/ Veg. S.L.	20+31.29	408.52	411.02	20+68.66	+37.37	408.52	411.02	Right
Riffle Grade Control	20+68.66	409.62	411.02	20+89.10	+20.44	409.31	410.71	
Toe Wood w/ S.L.	20+89.10	408.21	410.71	21+26.30	+37.20	408.21	410.71	Left
Riffle Grade Control	21+26.30	409.31	410.71	21+56.02	+29.72	408.87	410.27	
Toe Wood w/ S.L.	21+56.02	407.77	410.27	21+83.74	+27.72	407.77	410.27	Left
Cascading Riffle	21+83.74	408.87	410.27	22+15.14	+31.40	408.40	409.80	
Toe Wood w/ S.L.	22+15.14	407.30	409.80	22+59.20	+44.06	407.30	409.80	Right
Cascading Riffle	22+59.20	408.40	409.80	22+89.97	+30.77	407.63	409.03	
Stone Toe w/ Veg. S.L.	22+89.97	406.53	409.03	23+49.76	+59.79	406.53	409.03	Left
Riffle Grade Control	23+49.76	407.63	409.03	23+79.41	+29.65	406.89	408.29	
Pool	23+79.41	405.79	408.29	24+00.21	+20.80	405.79	408.29	Right
Riffle Grade Control	24+00.21	406.89	408.29	24+32.00	+31.79	405.92	407.32	

UT2 STRUCTURES								
TREATMENT	BEGIN STATION	THALWEG EL.	TOB EL.	END STATION	LENGTH	THALWEG EL.	TOB EL.	BANK
Constructed Riffle w/ S.L.	30+00.00	412.82	413.22	30+17.06	+17.06	412.48	412.88	
Pool	30+17.06	411.88	412.88	30+25.15	+8.09	411.88	412.88	Left
Riffle Grade Control	30+25.15	412.48	412.88	30+34.14	+8.99	412.24	412.64	
Pool	30+34.14	411.64	412.64	30+48.00	+13.86	411.64	412.64	Right
Riffle Grade Control	30+48.00	412.24	412.64	30+60.24	+12.24	412.00	412.40	
Stone Toe w/ Veg. S.L.	30+60.24	411.40	412.40	30+75.85	+15.61	411.40	412.40	Left
Riffle Grade Control	30+75.85	412.00	412.40	30+85.56	+9.71	411.80	412.20	
Toe Wood w/ S.L.	30+85.56	411.20	412.20	30+96.48	+10.92	411.20	412.20	Right
Riffle Grade Control	30+96.48	411.80	412.20	31+07.36	+10.88	411.53	411.93	
Pool	31+07.36	410.93	411.93	31+18.36	+11.00	410.93	411.93	Left
Riffle Grade Control	31+18.36	411.53	411.93	31+28.46	+10.10	411.13	411.53	
Toe Wood w/ S.L.	31+28.46	410.53	411.53	31+43.69	+15.23	410.53	411.53	Right
Riffle Grade Control	31+43.69	411.13	411.53	31+54.77	+11.08	410.68	411.08	
Stone Toe w/ Veg. S.L.	31+54.77	410.08	411.08	31+69.96	+15.19	410.08	411.08	Left
Riffle Grade Control	31+69.96	410.68	411.08	31+81.62	+11.66	410.22	410.62	
Stone Toe w/ Veg. S.L.	31+81.62	409.62	410.62	31+95.12	+13.50	409.62	410.62	Right
Riffle Grade Control	31+95.12	410.22	410.62	32+03.67	+8.55	409.88	410.28	
Toe Wood w/ S.L.	32+03.67	409.28	410.28	32+13.98	+10.31	409.28	410.28	Left
Riffle Grade Control	32+13.98	409.88	410.28	32+22.21	+8.23	409.46	409.86	
Pool	32+22.21	408.86	409.86	32+34.11	+11.90	408.86	409.86	Right
Riffle Grade Control	32+34.11	409.46	409.86	32+44.31	+10.20	408.95	409.35	
Stone Toe w/ Veg. S.L.	32+44.31	408.35	409.35	32+56.89	+12.58	408.35	409.35	Left
Riffle Grade Control	32+56.89	408.95	409.35	32+73.32	+16.43	408.10	408.50	

APPROVED:

DATE:

REVISIONS

	DESCRIPTION	DATE	APPROVED
A	60% DESIGN PLANS	09/2023	
B	60% DESIGN PLANS	02/2024	
C	FINAL CONSTRUCTION PLANS	05/2024	

KCI TECHNOLOGIES
500 11TH AVE. N, SUITE 290
NASHVILLE, TN 37203

LOCKELAND SPRINGS
STREAM RESTORATION PROJECT
DAVIDSON COUNTY, TENNESSEE

DATE: MAY 2024
SCALE: N.T.S.

STRUCTURE TABLES

STATE	KCI PROJECT NO.	SHEET NO.	TOTAL SHEETS
TN	162308039	1	5

A	60% DESIGN PLANS	09/2023	
B	60% DESIGN PLANS	02/2024	
C	FINAL CONSTRUCTION PLANS	05/2024	
SYM.	DESCRIPTION	DATE	APPROVED
REVISIONS			

KCI TECHNOLOGIES

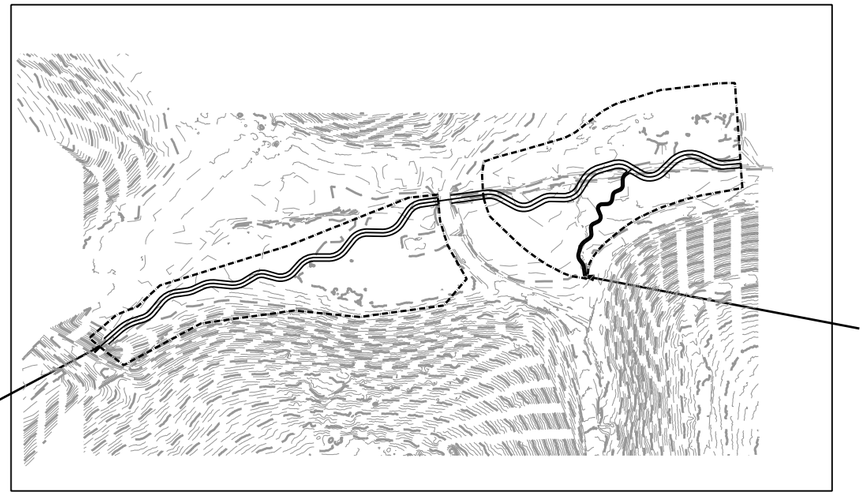
LOCKELAND SPRINGS STREAM RESTORATION

LOCATION: TWO UNNAMED TRIBURATIES IN SHELBY GOLF COURSE AND SHELBY PARK NASHVILLE, TENNESSEE

TYPE OF WORK: STREAM RESTORATION

VICINITY MAP
NOT TO SCALE

ISSUING AGENCY	*PERMIT #*
USACE NWP27:	*LRN–2023–00794*
TDEC ARAP:	*NRS23.27C*
TDEC NPDES:	*TBD*



SHEETS EC03, EC05

INDEX OF SHEETS

–150 0 150 300

TN GRID NAD '83

EROSION CONTROL PLANS

GRAPHIC SCALES
SEE SHEETS

Prepared in the Office of:

KCI TECHNOLOGIES
500 11TH AVENUE NORTH, SUITE 290
NASHVILLE, TN 37203

PROJECTED START DATE
SUMMER 2024

PROJECTED COMP. DATE
FALL 2024

GARY M. MRYNCZA, P.E.
PROJECT ENGINEER

JOSH SITZ AND EVAN WHITE
NATURAL CHANNEL DESIGN

GARY MICHAEL MRYNCZA REGISTERED ENGINEER AGRICULTURE COMMERCE NO. 111558 STATE OF TENNESSEE

Prepared for:

METRO WATER SERVICES

GENERAL NOTES:

SOIL TYPE: STIVERSVILL-URBAN LAND COMPLEX

RAIN GAUGE: CONTRACTOR SHALL BE RESPONSIBLE FOR HAVING A RAIN GAUGE ON THE PROJECT SITE AND FOR RECORDING DAILY RAINFALL AMOUNTS DURING CONSTRUCTION.

SITE PRESERVATION AGREEMENT:
THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIRING ANY DAMAGE TO EXISTING ROADS, GATES, FENCES, ETC. CONSTRUCTION ENTRANCES SHALL BE INSTALLED AT ALL ACCESS LOCATIONS PER THE PLANS AND SPECIFICATIONS. THE CONTRACTOR SHALL ALSO BE RESPONSIBLE FOR ANY IMPROVEMENT TO THE ROAD CONDITION, GATES, AND FENCES, REQUIRED FOR ACCESS DURING CONSTRUCTION, UNLESS THERE IS WRITTEN DOCUMENTATION WITH THE LANDOWNER CONCERNING A PRIOR AGREEMENT.

THE CONTRACTOR SHALL INSTALL AND MAINTAIN THROUGHOUT THE PROJECT CONSTRUCTION ALL EROSION CONTROL MEASURES IN ACCORDANCE WITH THESE PLANS AND IN ACCORDANCE WITH APPLICABLE EROSION AND SEDIMENT CONTROL REGULATIONS. THE CONTRACTOR SHALL CONTINUOUSLY MAINTAIN ALL EROSION CONTROL DEVICES AND STRUCTURES TO MINIMIZE EROSION.

ALL EROSION CONTROL MEASURES SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE TENNESSEE EROSION AND SEDIMENT CONTROL REGULATIONS, U.S. DEPARTMENT OF AGRICULTURE, AND U.S. SOIL CONSERVATION SERVICE REGULATIONS.

PRE-CONSTRUCTION EROSION CONTROL PLAN

SEDIMENT BARRIERS AND OTHER MEASURES INTENDED TO TRAP SEDIMENT SHALL BE CONSTRUCTED AS A FIRST STEP IN ANY LAND DISTURBING ACTIVITY AND SHALL BE MADE FUNCTIONAL BEFORE UPSLOPE LAND DISTURBANCE TAKES PLACE.

PRECONSTRUCTION SEQUENCE

A. IDENTIFY PROJECT BOUNDARY, LIMITS OF DISTURBANCE, SENSITIVE AREAS, STAGING AREAS, STABILIZED ENTRANCES, CROSSINGS, AND ACCESS POINTS WITH THE ENGINEER.
B. CONSTRUCT ENTRANCES, CROSSINGS, AND STAGING AREAS IN A MANNER TO SUPPORT EXECUTION OF THE STREAM RESTORATION IN PHASES AS INDICATED IN THE PLANS AND AS DIRECTED BY THE ENGINEER. INSTALL SILT FENCE ON THE DOWNSTREAM SIDE OF ACCESS ROADS AS NECESSARY.
C. INSTALL EROSION CONTROL DEVICES IN ACCORDANCE WITH THE SEDIMENT AND EROSION CONTROL PLANS AND AS DIRECTED BY THE ENGINEER.

SEDIMENT & EROSION CONTROL LEGEND

ACCESS ROADS

STABILIZED CONSTRUCTION ENTRANCE

SILT FENCE

LIMITS OF DISTURBANCE — LOD —

ORANGE SAFETY FENCE

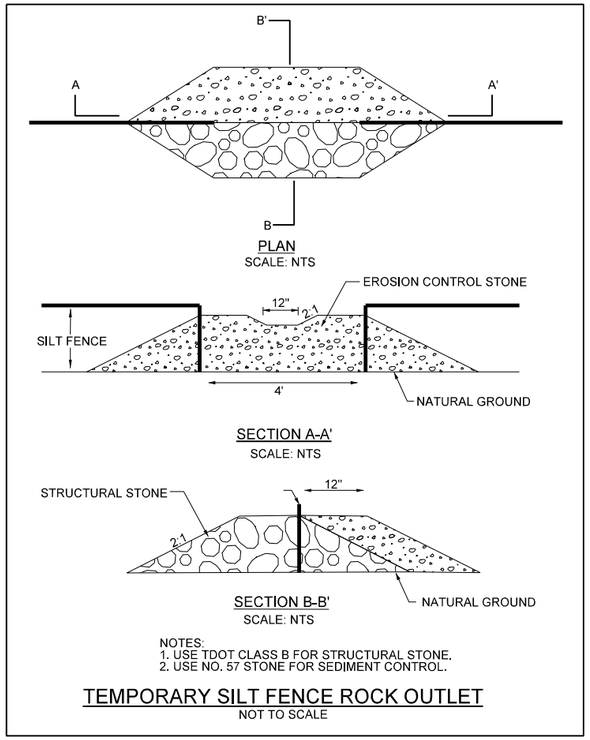
STAGING AREA

APPROVED:

DATE:

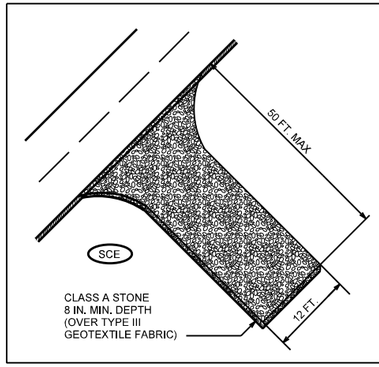
	DESCRIPTION	DATE	APPROVED
A	60% DESIGN PLANS	09/2023	
B	60% DESIGN PLANS	02/2024	
C	FINAL CONSTRUCTION PLANS	05/2024	

REVISIONS



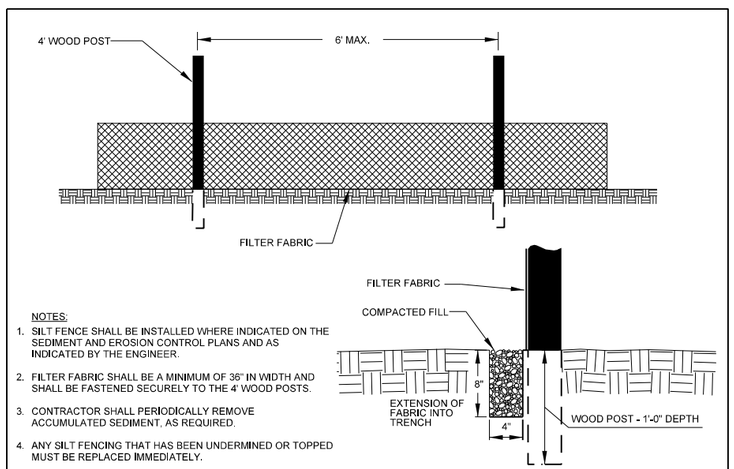
NOTES:
1. USE TDOT CLASS B FOR STRUCTURAL STONE.
2. USE NO. 57 STONE FOR SEDIMENT CONTROL.

TEMPORARY SILT FENCE ROCK OUTLET
NOT TO SCALE



NOTES:
1. TURNING RADIUS SUFFICIENT TO ACCOMODATE LARGE TRUCKS SHALL BE PROVIDED.
2. ENTRANCE(S) SHOULD BE LOCATED TO PROVIDE FOR UTILIZATION BY ALL CONSTRUCTION VEHICLES.
3. MUST BE MAINTAINED IN A CONDITION THAT WILL PREVENT TRACKING OR DIRECT FLOW OF MUD ONTO STREETS. PERIODIC TOPDRESSING WITH STONE WILL BE NECESSARY.
4. ANY MATERIAL TRACKED ONTO THE ROADWAY MUST BE CLEANED UP IMMEDIATELY.
5. GRAVEL CONSTRUCTION ENTRANCE SHALL BE LOCATED AT ALL POINTS OF INGRESS AND EGRESS UNTIL SITE IS STABILIZED. FREQUENT CHECKS OF THE DEVICE AND TIMELY MAINTENANCE MUST BE PROVIDED.

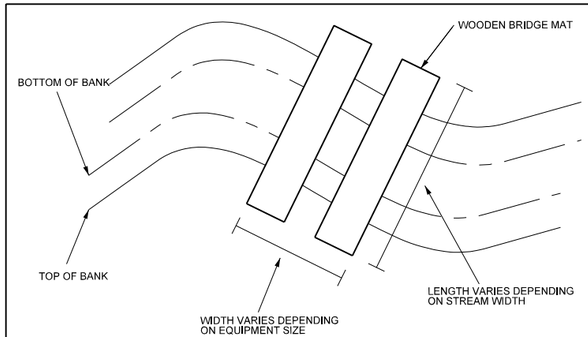
STABILIZED CONSTRUCTION ENTRANCE
SCALE: NTS



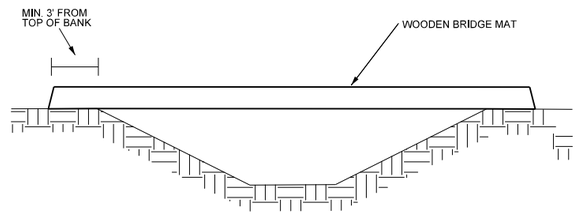
NOTES:
1. SILT FENCE SHALL BE INSTALLED WHERE INDICATED ON THE SEDIMENT AND EROSION CONTROL PLANS AND AS INDICATED BY THE ENGINEER.
2. FILTER FABRIC SHALL BE A MINIMUM OF 36" IN WIDTH AND SHALL BE FASTENED SECURELY TO THE 4' WOOD POSTS.
3. CONTRACTOR SHALL PERIODICALLY REMOVE ACCUMULATED SEDIMENT, AS REQUIRED.
4. ANY SILT FENCING THAT HAS BEEN UNDERMINED OR TOPPED MUST BE REPLACED IMMEDIATELY.

NOTE:
THE FILTER FABRIC SHALL MEET THE FOLLOWING REQUIREMENTS:
A) EOS IS NOT LARGER THAN U.S. STANDARD SIEVE NO.70
B) GRAB STRENGTH 90-120 LB
C) CONFORM TO ASTM D-1682 OR ASTM D-177

SILT FENCE DETAIL
NOT TO SCALE



PLAN VIEW



CROSS SECTION VIEW

TEMPORARY BRIDGE MAT CROSSING
SCALE: NTS

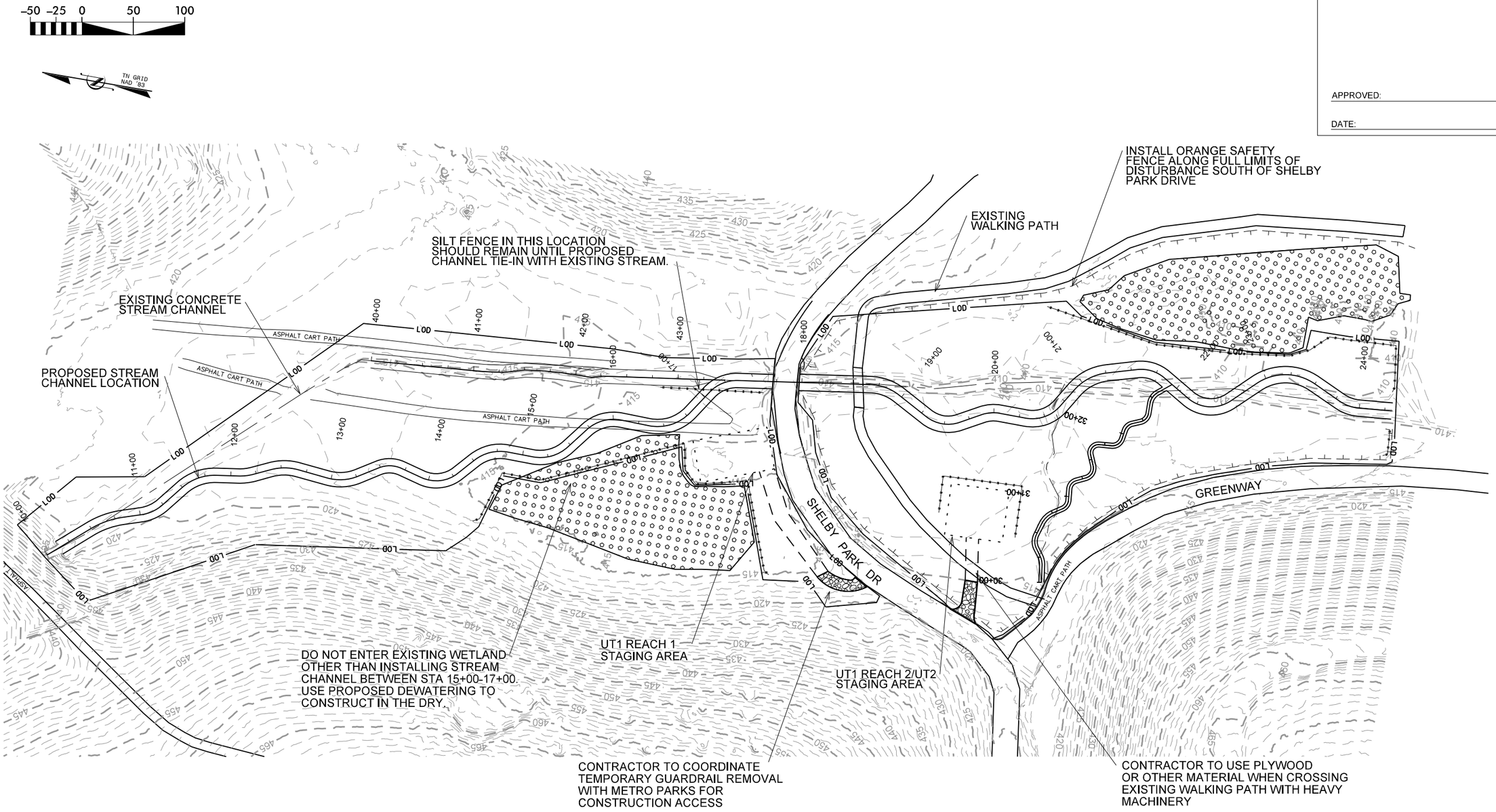
NOTES:
LOCATION IN FIELD WILL VARY. FINAL LOCATIONS WILL BE DETERMINED BY ENGINEER AND CONTRACTOR.

KCI TECHNOLOGIES
500 11TH AVE. N, SUITE 290
NASHVILLE, TN 37203

LOCKELAND SPRINGS
STREAM RESTORATION PROJECT
DAVIDSON COUNTY, TENNESSEE

DATE: MAY 2024
SCALE: N.T.S.

PRE-CONSTRUCTION EROSION CONTROL



APPROVED:

DATE:

	DESCRIPTION	DATE	APPROVED
A	60% DESIGN PLANS	09/2023	
B	60% DESIGN PLANS	02/2024	
C	FINAL CONSTRUCTION PLANS	05/2024	

REVISIONS

METRO WATER SERVICES

KCI TECHNOLOGIES
500 10TH AVE. N, SUITE 290
NASHVILLE, TN 37203

LOCKELAND SPRINGS STREAM RESTORATION PROJECT

DAVIDSON COUNTY, TENNESSEE

DATE: MAY 2024

SCALE: GRAPHIC

PRE-CONSTRUCTION EROSION CONTROL

SHEET EC03 OF EC05

INTERIM EROSION CONTROL PLAN:

EROSION AND SEDIMENT CONTROL MEASURES SHALL BE MAINTAINED CONTINUOUSLY, RELOCATED WHEN AND AS NECESSARY, AND SHALL BE CHECKED AFTER EVERY RAINFALL. SEEDED AREAS SHALL BE CHECKED REGULARLY AND SHALL BE WATERED, FERTILIZED, RESEEDED AND MULCHED AS NECESSARY TO OBTAIN A DENSE STAND OF GRASS.

STABILIZATION IS THE BEST FORM OF EROSION CONTROL. ALL DISTURBED AREAS THAT ARE NOT OTHERWISE STABILIZED SHALL BE AMENDED AND SEEDED, TEMPORARILY OR PERMANENTLY IN ACCORDANCE WITH THE TENNESSEE SEDIMENT CONTROL REGULATIONS. PERMANENT SEEDING AND GRASS ESTABLISHMENT ARE REQUIRED PRIOR TO PROJECT COMPLETION AND ACCEPTANCE.

CONTRACTOR SHALL PROVIDE GROUND COVER ON EXPOSED SLOPES WITHIN 14 CALENDAR DAYS FOLLOWING COMPLETION OF ANY PHASE OF GRADING. PERMANENT GROUND COVER FOR ALL DISTURBED AREAS SHALL BE PROVIDED WITHIN 14 CALENDAR DAYS FOLLOWING COMPLETION OF CONSTRUCTION.

WHERE SEDIMENT IS TRANSPORTED ONTO A PAVED OR PUBLIC ROAD SURFACE, THE ROAD SURFACE SHALL BE CLEANED THOROUGHLY AT THE END OF EACH DAY. WHEN A CRUSHED STONE CONSTRUCTION ENTRANCE HAS BEEN COVERED WITH SOIL OR HAS BEEN PUSHED INTO THE SOIL BY CONSTRUCTION TRAFFIC, IT SHALL BE REPLACED WITH A DEPTH OF STONE EQUAL TO THAT OF THE ORIGINAL APPLICATION.

DURING CONSTRUCTION OF THE PROJECT, SOIL STOCKPILES SHALL BE STABILIZED OR PROTECTED WITH SEDIMENT TRAPPING MEASURES. THE APPLICANT IS RESPONSIBLE FOR THE TEMPORARY PROTECTION AND PERMANENT STABILIZATION OF ALL SOIL STOCKPILES ON SITE AS WELL AS SOIL INTENTIONALLY TRANSPORTED FROM THE PROJECT SITE.

SEQUENCE OF CONSTRUCTION FOR STREAM RESTORATION (TYPICAL):

THE CONTRACTOR SHALL ONLY CONDUCT STREAM WORK, INCLUDING ALL IN-STREAM STRUCTURES, GRADING, STABILIZATION MEASURES AND SEEDING AND MULCHING WORK, ON A SECTION OF STREAM THAT CAN BE ENTIRELY COMPLETED WITHIN A SINGLE DAY.

A. INITIATE STREAM CHANNEL WORK ON A SEGMENT OF STREAM THAT CAN BE COMPLETED IN ONE DAY. STREAM WORK WILL BE CONDUCTED IN THE DRY AND WILL INCLUDE EXCAVATION OF THE STREAMBED, EXCAVATION OF THE STREAM BANKS, AND INSTALLATION OF STABILIZATION MEASURES IN ACCORDANCE WITH THE PLANS AND SPECIFICATIONS. ANY WETTED SECTIONS OF STREAM MUST BE PUMPED AROUND ACCORDING TO THE INCLUDED SPECIFICATION BEFORE WORK CAN BE INITIATED.
B. CLEAR AND STOCKPILE WOODY DEBRIS FROM BANKS AS INDICATED ON THE PLAN SHEETS AND AS DIRECTED BY THE ENGINEER. STOCKPILE ALL WOODY DEBRIS FOR USE IN CHANNEL STRUCTURES AND BANK STABILIZATION.
C. EXCAVATE AND GRADE CHANNEL ACCORDING TO THE PLAN AND PROFILE SHEETS.
D. STOCKPILE MATERIAL FOR BACKFILL USE LATER AS NECESSARY WITHIN THE LIMITS OF DISTURBANCE.
E. INSTALL BANK STABILIZATION TREATMENTS AND ANY IN-STREAM STRUCTURES.
F. PLANT, SEED AND MULCH WORK AREA USING TEMPORARY SEED MIXTURE.

INSPECTION SCHEDULE FOR OUTLETS
OUTLET POINTS ARE LABELED ON THE EROSION CONTROL PLANS.

EACH OUTLET WILL BE INSPECTED TWICE A WEEK WITH A MINIMUM OF 72 HOURS SEPARATION BETWEEN INSPECTIONS. IF A STORM EVENT IS PREDICTED FOR THE PROJECT AREA, THE OUTLETS SHALL BE INSPECTED BEFORE THE STORM TO ENSURE THEY ARE INTACT. AFTER A STORM EVENT, THE OUTLETS MUST BE INSPECTED AND MAINTENANCE PERFORMED AS NECESSARY.

MULCHING:

SEEDED AREAS ARE TO BE PROTECTED BY SPREADING STRAW MULCH UNIFORMLY TO FORM A CONTINUOUS BLANKET (75% COVERAGE = 2 TONS/ACRE) OVER SEEDED AREAS. CONTRACTOR MAY PROPOSE ALTERNATE METHODS OF SEEDING AND MULCHING (HYDRO-SEEDING) UPON SUBMISSION TO THE ENGINEER OF CALCULATIONS SHOWING THE EQUIVALENCY OF THE PROPOSED METHOD.

APPROVED:

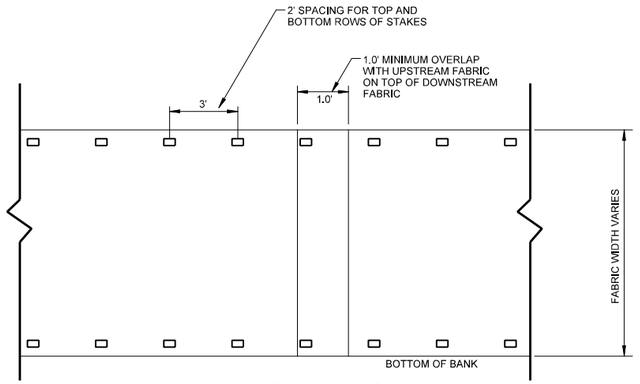
DATE:

TEMPORARY SEED MIX (WINTER):

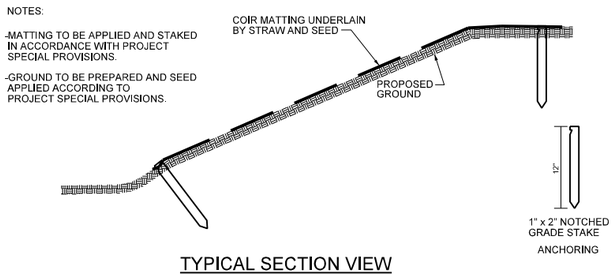
COMMON NAME	SCIENTIFIC NAME	PLANTING RATE PER ACRE (LBS)	AREA (ACRES)	TIME PERIOD	TOTAL (LBS)
WINTER RYE (RYE GRAIN)	SECALE CEREALE	30	4.8	11/1 -4/1	144
WINTER WHEAT	TRITICUM AESTIVUM	30	4.8	11/1 -4/1	144

TEMPORARY SEED MIX (SUMMER):

COMMON NAME	SCIENTIFIC NAME	PLANTING RATE PER ACRE (LBS)	AREA (ACRES)	TIME PERIOD	TOTAL (LBS)
FOXTAIL BRISTLEGRASS	SETARIA ITALICA	10	4.8	4/1 - 11/1	48
BROWNTOP MILLET	UROCHLOA RAMOSA	30	4.8	4/1 - 11/1	144



TYPICAL PLAN VIEW



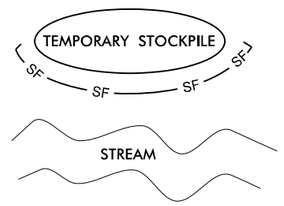
TYPICAL SECTION VIEW

COIR MATTING
SCALE: NTS

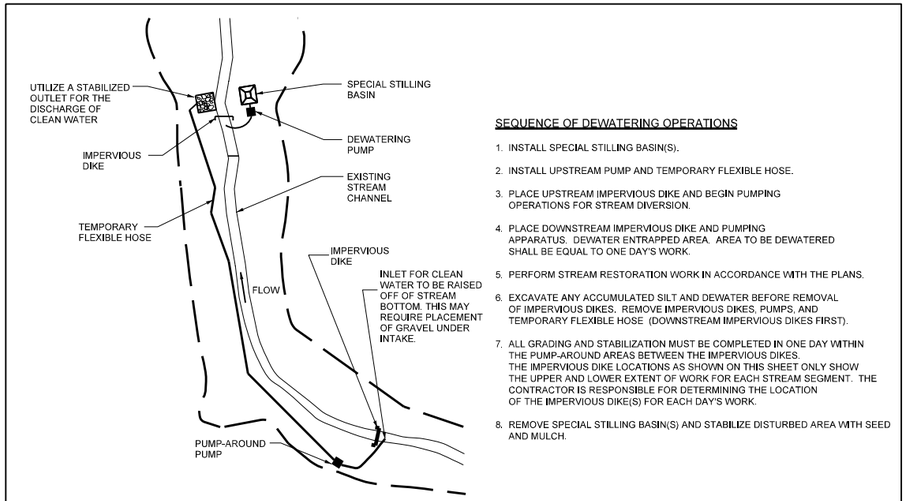
ADDITIONAL NOTES:

- ALL DISTURBED AREAS MUST BE SEEDED AND MULCHED IN ACCORDANCE WITH THE EROSION CONTROL PLANS.

- ALL TEMPORARY STOCKPILES SHALL HAVE SILT FENCE INSTALLED ON THE DOWN GRADIENT SIDE OF THE STOCKPILE, AS SHOWN IN THE TYPICAL DETAIL BELOW.



TEMPORARY STOCKPILE

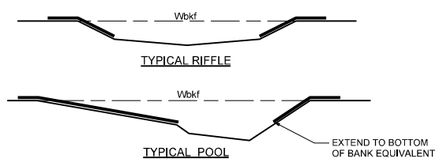


EXAMPLE OF PUMP-AROUND OPERATION

SEQUENCE OF DEWATERING OPERATIONS

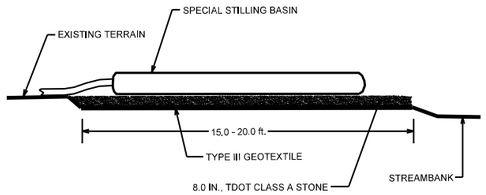
1. INSTALL SPECIAL STILLING BASIN(S).
2. INSTALL UPSTREAM PUMP AND TEMPORARY FLEXIBLE HOSE.
3. PLACE UPSTREAM IMPERVIOUS DIKE AND BEGIN PUMPING OPERATIONS FOR STREAM DIVERSION.
4. PLACE DOWNSTREAM IMPERVIOUS DIKE AND PUMPING APPARATUS. DEWATER ENTRAPPED AREA. AREA TO BE DEWATERED SHALL BE EQUAL TO ONE DAY'S WORK.
5. PERFORM STREAM RESTORATION WORK IN ACCORDANCE WITH THE PLANS.
6. EXCAVATE ANY ACCUMULATED SILT AND DEWATER BEFORE REMOVAL OF IMPERVIOUS DIKES. REMOVE IMPERVIOUS DIKES, PUMPS, AND TEMPORARY FLEXIBLE HOSE (DOWNSTREAM IMPERVIOUS DIKES FIRST).
7. ALL GRADING AND STABILIZATION MUST BE COMPLETED IN ONE DAY WITHIN THE PUMP-AROUND AREAS BETWEEN THE IMPERVIOUS DIKES. THE IMPERVIOUS DIKE LOCATIONS AS SHOWN ON THIS SHEET ONLY SHOW THE UPPER AND LOWER EXTENT OF WORK FOR EACH STREAM SEGMENT. THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING THE LOCATION OF THE IMPERVIOUS DIKE(S) FOR EACH DAY'S WORK.
8. REMOVE SPECIAL STILLING BASIN(S) AND STABILIZE DISTURBED AREA WITH SEED AND MULCH.

EXAMPLE COIR MATTING PLACEMENT



NOTE: MATTING SHALL BE INSTALLED ALONG BOTH BANKS PRIOR TO THE INTRODUCTION OF WATER INTO A STREAM SECTION FOR THOSE REACHES TO BE DEWATERED.

BANKFULL WATER SURFACE
GROUND SURFACE
COIR MATTING



SPECIAL STILLING BASIN WITH ROCK PAD
NOT TO SCALE

NOTE: PROVIDE STABILIZED OUTLET DOWN BANK TO STREAM

A	60% DESIGN PLANS	09/2023		
B	60% DESIGN PLANS	02/2024		
C	FINAL CONSTRUCTION PLANS	05/2024		
		DESCRIPTION	DATE	APPROVED
		SYM.	REVISIONS	

KCI TECHNOLOGIES
500 11TH AVE. N, SUITE 290
NASHVILLE, TN 37203

LOCKELAND SPRINGS
STREAM RESTORATION PROJECT
DAVIDSON COUNTY, TENNESSEE

DATE: MAY 2024
SCALE: N.T.S.

INTERIM CONSTRUCTION EROSION CONTROL

SHEET EC04 OF EC05

FINAL STABILIZATION EROSION CONTROL PLAN

ALL TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES SHALL BE REMOVED WITHIN 14 DAYS AFTER FINAL SITE STABILIZATION OR AFTER THE TEMPORARY MEASURES ARE NO LONGER NEEDED. TRAPPED SEDIMENT AND THE DISTURBED SOIL AREAS RESULTING FROM THE DISPOSITION OF TEMPORARY MEASURES SHALL BE PERMANENTLY STABILIZED TO PREVENT FURTHER EROSION AND SEDIMENTATION.

THE CONTRACTOR IS RESPONSIBLE FOR FOLLOWING THE SEQUENCE OF CONSTRUCTION IN ACCORDANCE WITH THE PLANS AND THE FOLLOWING PROVISIONS, AS DIRECTED BY THE ENGINEER.

SEQUENCE OF CONSTRUCTION FOR FINAL PROJECT COMPLETION

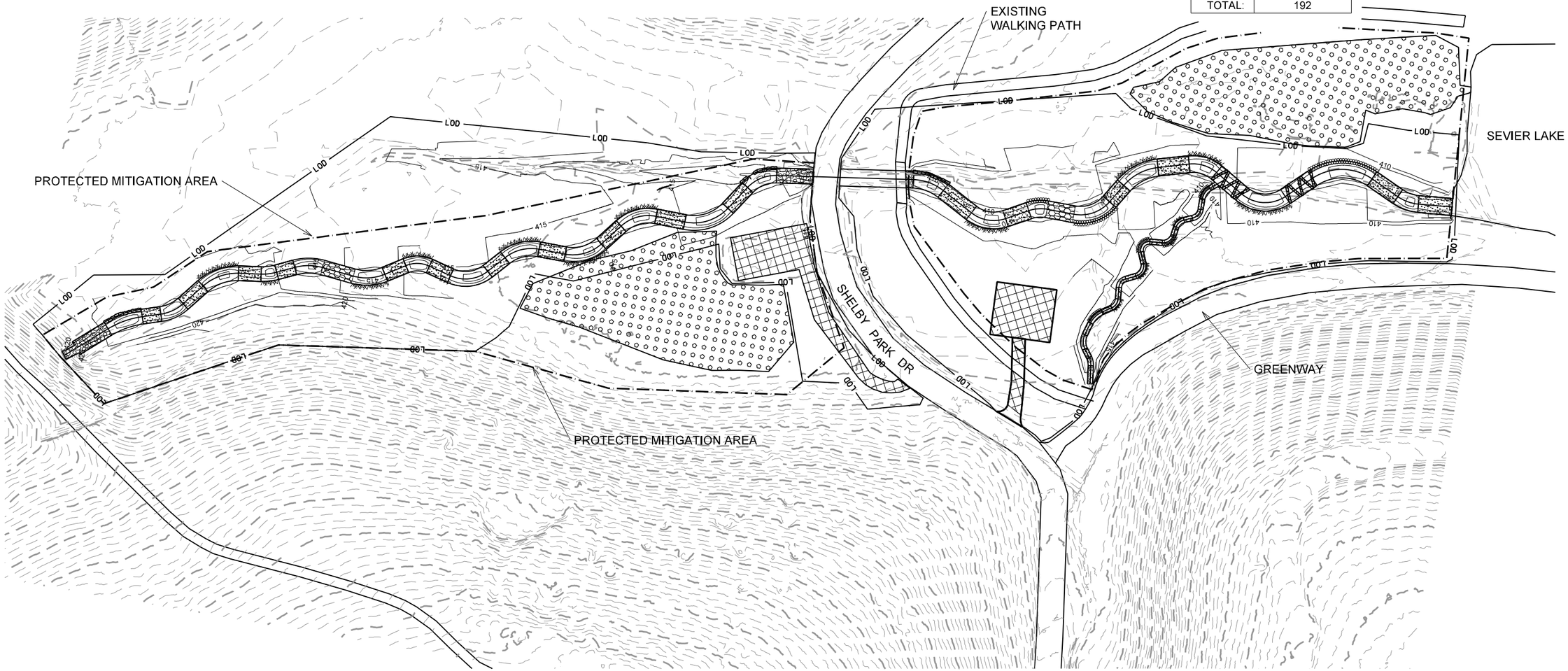
A. RIPARIAN BUFFER PLANTING
   1. PREPARE AND PLANT BANK AND RIPARIAN VEGETATION IN ACCORDANCE WITH PLANTING PLAN SHEETS AND AS DIRECTED BY THE ENGINEER. WOODY PLANTS MUST BE PLANTED DURING THE DORMANT SEASON (NOVEMBER - MARCH).

B. FINAL COMPLETION OF PROJECT SITE
   1. REMOVE ALL REMAINING WASTE MATERIALS AND RESTORE THE REMAINING STAGING AND ACCESS AREAS TO THEIR PRIOR CONDITION. SEED AND MULCH ALL DISTURBED AREAS UTILIZING THE SEED/MULCH MIXES SPECIFIED IN THE PLANS. APPLY TOPSOIL AMMENDMENTS AS NEEDED. PREPARE PROJECT RED-LINE DRAWINGS FOLLOWING THE FINAL INSPECTION

NOTES:
- PERMANENT STABILIZATION IS ONLY SHOWN ON THESE PLANS AT STAGING AREAS AND CONSTRUCTION ACCESS POINTS, BUT WILL ALSO INCLUDE AREAS OF STREAM RESTORATION THAT ARE DISTURBED IN THE FIELD.
- PERMANENT STABILIZATION IN DISTURBED AREAS OUTSIDE OF THE PROTECTED MITIGATION AREA WILL BE PERMANENTLY STABILIZED WITH SOD.

PERMANENT SEED MIX INSIDE OF THE PROTECTED MITIGATION AREA:

COMMON NAME	SCIENTIFIC NAME	PLANTING RATE PER ACRE (LBS)	AREA (ACRES)	TOTAL LBS.
SWITCHGRASS	PANICUM VIRGATUM	10	4.8	48.0
RIVERBANK WILD RYE	ELYMUS RIPARIUS	10	4.8	48.0
REDTOP	AGROSTIS GIGANTEA	6	4.8	28.8
EASTERN GAMMA GRASS	TRIPSACUM DACTYLIDES	5	4.8	24.0
DEER TONGUE	PANICUM CLANDESTINUM	2	4.8	9.6
SHOWY TICKSEED	BIDENS ARISTOSA	2	4.8	9.6
NARROW-LEAF COREOPSIS	COREOPSIS LANCEOLATA	2	4.8	9.6
FOX SEDGE	CAREX VULPINOIDEA	2	4.8	9.6
RIVER OATS	CHASMANTHIUM LATIFOLIUM	1	4.8	4.8
			TOTAL:	192



APPROVED:

DATE:

–50 –25 0 50 100

TN GRID NAD '83

REVISIONS			
	DESCRIPTION	DATE	APPROVED
A	60% DESIGN PLANS	09/2023	
B	60% DESIGN PLANS	02/2024	
C	FINAL CONSTRUCTION PLANS	05/2024	

SYM.

KCI TECHNOLOGIES
500 11TH AVE. N. SUITE 290
NASHVILLE, TN 37203

LOCKELAND SPRINGS
STREAM RESTORATION PROJECT
DAVIDSON COUNTY, TENNESSEE

DATE: MAY 2024
SCALE: GRAPHIC

FINAL STABILIZATION EROSION CONTROL

SHEET EC05 OF EC05

Appendix F

Site Protection Instrument

Appendix G

Preliminary Construction

Cost Estimate

ETC
KCI ENVIRONMENTAL
TECHNOLOGIES AND CONSTRUCTION INC.

500 11th Avenue North, Suite 290 • Nashville, TN 37203 • Phone 615.370.8410 • Fax 615.370.8455

Exhibit G-1 Construction Estimate

LOCKELAND SPRINGS PERMITTEE RESPONSIBLE MITIGATION CONSTRUCTION ESTIMATE					
Item No.	Item	Quantity	Units	Unit Price	Total
1	Mobilization	1	LS	$ 40,000.00	$ 40,000.00
2	Construction Survey/Stakeout	1	LS	$ 20,000.00	$ 20,000.00
3	Clearing and Grubbing	1.7	AC	$ 6,000.00	$ 10,200.00
4	Stream & Floodplain Grading/Excavation	4314	CY	$ 20.00	$ 86,280.00
6	Concrete Removal	1	LS	$ 10,000.00	$ 10,000.00
7	Topsoil (removal, temp. stockpile, replacement)	820	CY	$ 15.00	$ 12,300.00
8	Toe Wood with Soil Lift	432	LF	$ 65.00	$ 28,080.00
9	TDOT Class A-3 Machined Rip Rap	16	Tons	$ 80.00	$ 1,280.00
10	TDOT Class B Machined Rip Rap	224	Tons	$ 90.00	$ 20,160.00
11	TDOT Class A-1 Machined Rip Rap	459	Tons	$ 85.00	$ 39,015.00
12	Filter Fabric	47	SY	$ 5.00	$ 235.00
13	700g Coir Fiber Matting	1044	SY	$ 20.00	$ 20,880.00
14	Pump-around/De-watering	1	LS	$ 20,000.00	$ 20,000.00
15	Silt Fence	1950	LF	$ 3.50	$ 6,825.00
16	Soil Lifts	739	LF	$ 30.00	$ 22,170.00
17	Riparian Plantings (Bare Root)	4308	EA	$ 4.00	$ 17,232.00
18	Live Stake	2227	EA	$ 4.00	$ 8,908.00
19	Temporary Seeding (w/ Straw Mulch)	5.7	AC	$ 1,100.00	$ 6,270.00
20	Permanent Seed (w/ Straw Mulch)	4	AC	$ 1,750.00	$ 7,000.00
				Total	**$ 376,835.00**

Appendix I

Other Information (JD & IPAC Report)

ATTACHMENT

PRELIMINARY JURISDICTIONAL DETERMINATION (PJD) FORM

BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR (PJD):

B. NAME AND ADDRESS OF PERSON REQUESTING PRELIMINARY JD:

Josh Sitz
500 11th Ave North, Suite 290
Nashville, TN 37203

C. DISTRICT OFFICE, FILE NAME, AND NUMBER:

Nashville District

D. PROJECT LOCATION(S) AND BACKGROUND INFORMATION:
(USE THE ATTACHED TABLE TO DOCUMENT MULTIPLE AQUATIC RESOURCES AND/OR AQUATIC RESOURCES AT DIFFERENT SITES)

State: TN County/parish/borough: Davidson City: Nashville
Center coordinates of site (lat/long in degree decimal format):
Lat. 36.172803° **N**, Long. -86.73119° **W**.
Universal Transverse Mercator:

Name of nearest waterbody: Sevier Lake

Identify (estimate) amount of waters in the review area:

Non-wetland waters:

208 linear feet of Intermittent Stream

linear feet of Ephemeral Stream

1343 linear feet of Perennial Stream

Wetlands: 0.99 acres

Open Waters: 0 acres

E. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):

☐ Office (Desk) Determination. Date:
☐ Field Determination. Date(s):

TABLE OF AQUATIC RESOURCES IN REVIEW AREA WHICH "MAY BE" SUBJECT TO REGULATORY JURISDICTION.

Site number	Latitude (decimal degrees)	Longitude (decimal degrees)	Estimated amount of aquatic resource in review area (acreage and linear feet, if applicable)	Type of aquatic resource (i.e., wetland vs. non-wetland waters)	Geographic authority to which the aquatic resource "may be" subject (i.e., Section 404 or Section 10/404)
SEE ATTACHED TABLE					

1. The Corps of Engineers believes that there may be jurisdictional aquatic resources in the review area, and the requestor of this PJD is hereby advised of his or her option to request and obtain an approved JD (AJD) for that review area based on an informed decision after having discussed the various types of JDs and their characteristics and circumstances when they may be appropriate.

2. In any circumstance where a permit applicant obtains an individual permit, or a Nationwide General Permit (NWP) or other general permit verification requiring "pre-construction notification" (PCN), or requests verification for a non-reporting NWP or other general permit, and the permit applicant has not requested an AJD for the activity, the permit applicant is hereby made aware that: (1) the permit applicant has elected to seek a permit authorization based on a PJD, which does not make an official determination of jurisdictional aquatic resources; (2) the applicant has the option to request an AJD before accepting the terms and conditions of the permit authorization, and that basing a permit authorization on an AJD could possibly result in less compensatory mitigation being required or different special conditions; (3) the applicant has the right to request an individual permit rather than accepting the terms and conditions of the NWP or other general permit authorization; (4) the applicant can accept a permit authorization and thereby agree to comply with all the terms and conditions of that permit, including whatever mitigation requirements the Corps has determined to be necessary; (5) undertaking any activity in reliance upon the subject permit authorization without requesting an AJD constitutes the applicant's acceptance of the use of the PJD; (6) accepting a permit authorization (e.g., signing a proffered individual permit) or undertaking any activity in reliance on any form of Corps permit authorization based on a PJD constitutes agreement that all aquatic resources in the review area affected in any way by that activity will be treated as jurisdictional, and waives any challenge to such jurisdiction in any administrative or judicial compliance or enforcement action, or in any administrative appeal or in any Federal court; and (7)whether the applicant elects to use either an AJD or a PJD, the JD will be processed as soon as practicable. Further, an AJD, a proffered individual permit (and all terms and conditions contained therein), or individual permit denial can be administratively appealed pursuant to 33 C.F.R. Part 331. If, during an administrative appeal, it becomes appropriate to make an official determination whether geographic jurisdiction exists over aquatic resources in the review area, or to provide an official delineation of jurisdictional aquatic resources in the review area, the Corps will provide an AJD to accomplish that result, as soon as is practicable. This PJD finds that there *"may be"* waters of the U.S. and/or that there *"may be"* navigable waters of the U.S. on the subject review area, and identifies all aquatic features in the review area that could be affected by the proposed activity, based on the following information:

SUPPORTING DATA. Data reviewed for preliminary JD (check all that apply - checked items should be included in case file and, where checked and requested, appropriately reference sources below):

☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant:

Map: Vicinity Map .

☐ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
- ☐ Office concurs with data sheets/delineation report.
- ☐ Office does not concur with data sheets/delineation report. Rationale: .

☐ Data sheets prepared by the Corps: .

☐ Corps navigable waters' study: .

☐ U.S. Geological Survey Hydrologic Atlas: .
- ☐ USGS NHD data.
- ☐ USGS 8 and 12 digit HUC maps.

☒ U.S. Geological Survey map(s). Cite scale & quad name: 1:24, Nashville-East

☐ Natural Resources Conservation Service Soil Survey. Citation:

☐ National wetlands inventory map(s). Cite name: .

☐ State/Local wetland inventory map(s): .

☐ FEMA/FIRM maps: .

☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)

☐ Photographs: ☒ Aerial (Name & Date): Vexcel Imagery 2023

or ☐ Other (Name & Date): .

☐ Previous determination(s). File no. and date of response letter: .

☐ Other information (please specify): .

IMPORTANT NOTE: The information recorded on this form has not necessarily been verified by the Corps and should not be relied upon for later jurisdictional determinations.

_____	_____
Signature and date of Project Manager (REQUIRED)	Signature and date of person requesting preliminary JD (REQUIRED, unless obtaining the signature is impracticable)[1]

[1] Districts may establish timeframes for requestor to return signed PJD forms. If the requestor does not respond within the established time frame, the district may presume concurrence and no additional follow up is necessary prior to finalizing an action. For the Nashville District, concurrence is presumed after 30 days.

Table 1.

Stream Name	Statue	Length (Feet)	Width (Feet)	Cowardin Class	Latitude	Longitude
UT1 Reach 1	Perennial	762	14	Riverine	36.1747	-86.7321
UT1 Reach 2	Perennial	515	12	Riverine	36.1728	-86.7311
UT 2	Intermittent	208	4	Riverine	36.1721	-86.7310

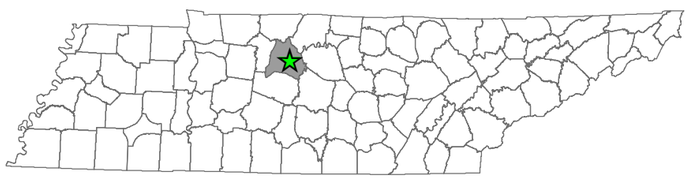
Table 2.

Wetland ID	Receiving Water	Hydrologic Class	Cowardin Class	Size (Acres)	USACE Forms		Latitude	Longitude
					WET	UP		
WA	UT1	Riparian	PEM	0.52	WA	WAup	36.1716	-86.7305
WB	UT1	Riparian	PEM*	0.48	WB	WAup	36.1732	-86.7316

PEM - Palustrine Emergent; PSS - Palustrine Scrub Shrub; PFO - Palustrine Forested

* - Vegetation Disturbed by regular mowing

Lat 36.172803 / Long -86.73119



Project Location:
Davidson Coutny, TN

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

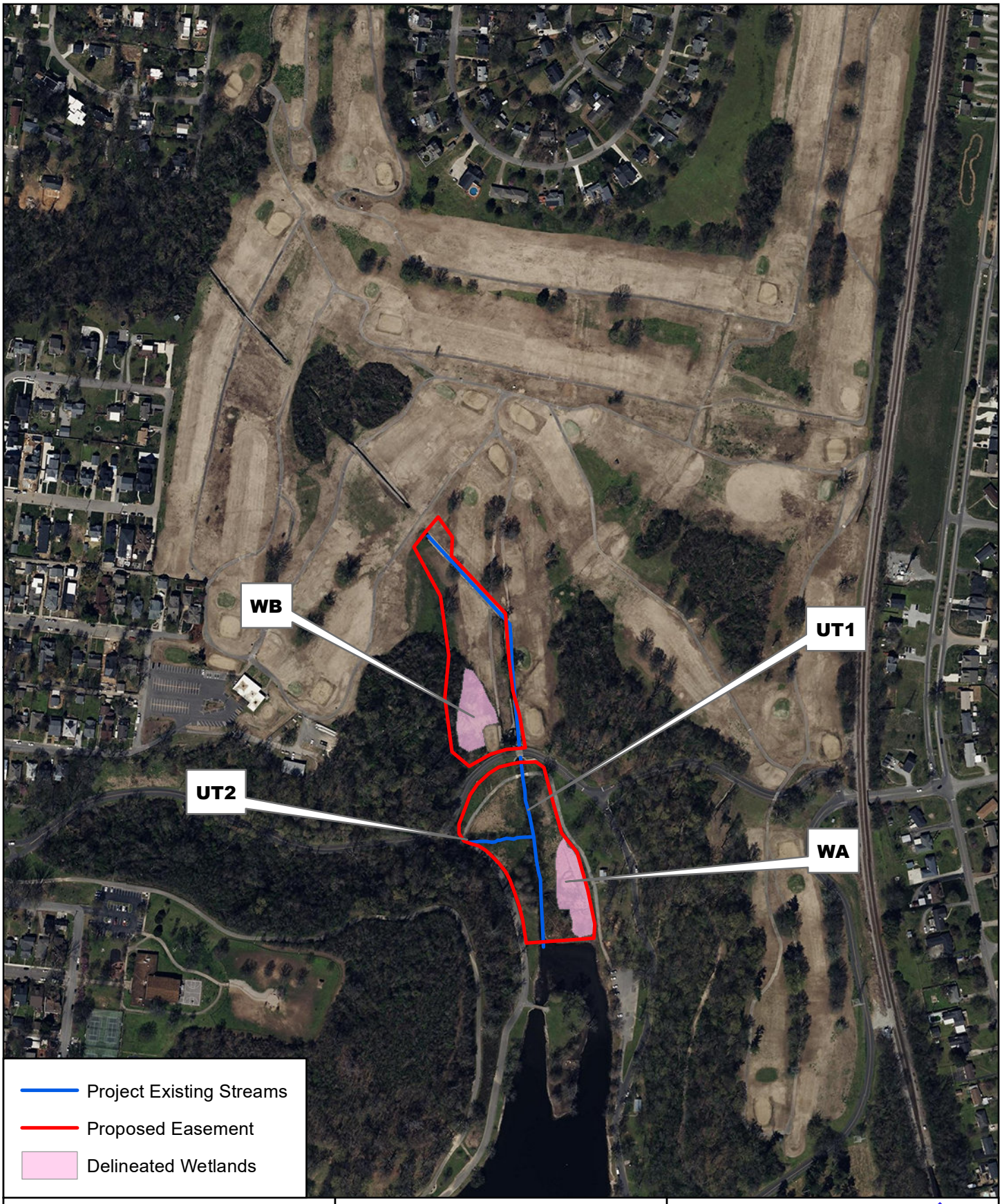
KCI TECHNOLOGIES

FIGURE 1. VICINITY MAP
LOCKELAND SPRINGS RESTORATION SITE
DAVIDSON COUNTY,TN

N

Project Location

0 1,500 3,000
Feet



0 300 600 Feet

Aerial Source: Vexcel Imagery 2023

FIGURE 2. AERIAL MAP
LOCKELAND SPRINGS
RESTORATION SITE
DAVIDSON COUNTY, TN

N

KCI TECHNOLOGIES

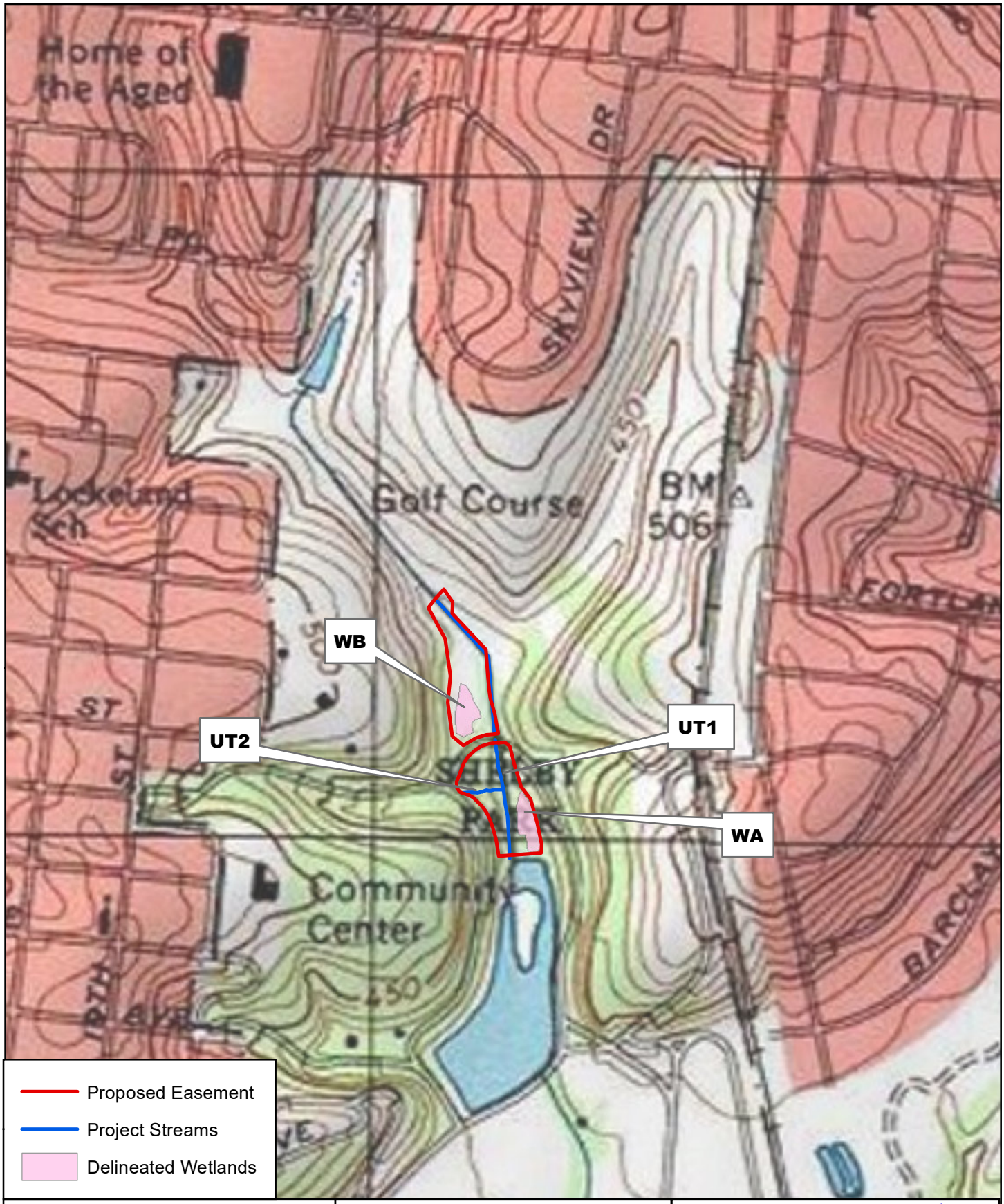


FIGURE 3. USGS TOPOGRAPHIC MAP
LOCKELAND SPRINGS
RESTORATION SITE
DAVIDSON COUNTY, TN

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Davidson County, Tennessee

Local office

Tennessee Ecological Services Field Office

(931) 528-6481
(931) 528-7075

446 Neal Street
Cookeville, TN 38501-4027

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

---

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information. IPaC only shows species that are regulated by USFWS (see FAQ).

2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Gray Bat Myotis grisescens Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/6329	Endangered
Northern Long-eared Bat Myotis septentrionalis Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9045	Endangered
Tricolored Bat Perimyotis subflavus Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

Birds

NAME	STATUS
Whooping Crane Grus americana No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/758	EXPN

Clams

NAME	STATUS
Cumberlandian Combshell Epioblasma brevidens There is **final** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/3119	Endangered

Orangefoot Pimpleback (pearlymussel) Plethobasus cooperianus — Endangered
Wherever found
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/1132

Pink Mucket (pearlymussel) Lampsilis abrupta — Endangered
Wherever found
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/7829

Ring Pink (mussel) Obovaria retusa — Endangered
Wherever found
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/4128

Insects

NAME	STATUS

Monarch Butterfly Danaus plexippus — Candidate
Wherever found
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/9743

Flowering Plants

NAME	STATUS

Braun's Rock-cress Arabis perstellata — Endangered
Wherever found
There is **final** critical habitat for this species. Your location does not overlap the critical habitat.
https://ecos.fws.gov/ecp/species/4704

Guthrie's (=pyne's) Ground-plum Astragalus bibullatus — Endangered
Wherever found
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/1739

Leafy Prairie-clover Dalea foliosa — Endangered
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/5498

Price''s Potato-bean Apios priceana — Threatened

No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/7422

Short's Bladderpod Physaria globosa — Endangered

Wherever found

There is **final** critical habitat for this species. Your location does not overlap the critical habitat.
https://ecos.fws.gov/ecp/species/7206

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

There are no critical habitats at this location.

You are still required to determine if your project(s) may have effects on all above listed species.

Bald & Golden Eagles

Bald and golden eagles are protected under the Bald and Golden Eagle Protection Act[1] and the Migratory Bird Treaty Act[2].

Any person or organization who plans or conducts activities that may result in impacts to bald or golden eagles, or their habitats[3], should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

Additional information can be found using the following links:

- Eagle Managment https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf

- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

There are bald and/or golden eagles in your project area.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle Haliaeetus leucocephalus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Sep 1 to Jul 31

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week

12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.

3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

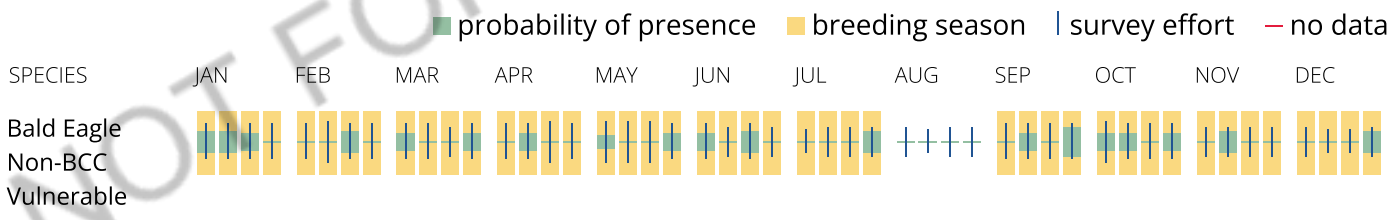
Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



What does IPaC use to generate the potential presence of bald and golden eagles in my specified location?

The potential for eagle presence is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply). To see a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What does IPaC use to generate the probability of presence graphs of bald and golden eagles in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur. Please contact your local Fish and Wildlife Service Field Office if you have questions.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats[3] should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how

this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Sep 1 to Jul 31
Black-billed Cuckoo *Coccyzus erythropthalmus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9399	Breeds May 15 to Oct 10
Bobolink *Dolichonyx oryzivorus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Jul 31
Cerulean Warbler *Dendroica cerulea* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/2974	Breeds Apr 23 to Jul 20
Chimney Swift *Chaetura pelagica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Mar 15 to Aug 25
Field Sparrow *Spizella pusilla* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds Mar 1 to Aug 15

Henslow's Sparrow Ammodramus henslowii This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3941	Breeds May 1 to Aug 31
Kentucky Warbler Oporornis formosus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 20 to Aug 20
Lesser Yellowlegs Tringa flavipes This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Prairie Warbler Dendroica discolor This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Jul 31
Prothonotary Warbler Protonotaria citrea This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 1 to Jul 31
Red-headed Woodpecker Melanerpes erythrocephalus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10
Rusty Blackbird Euphagus carolinus This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds elsewhere
Wood Thrush Hylocichla mustelina This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Aug 31

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

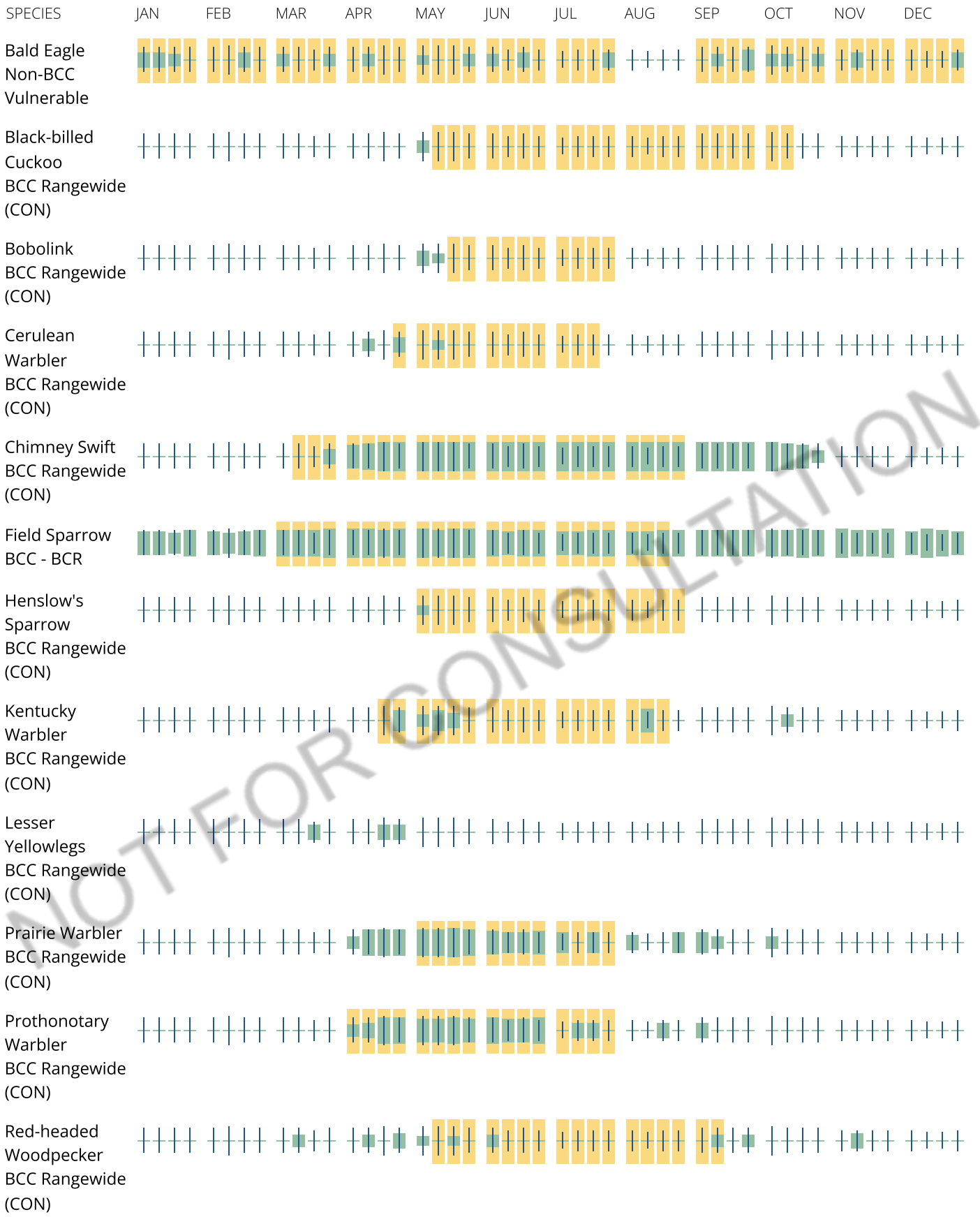
Breeding Season (▪)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

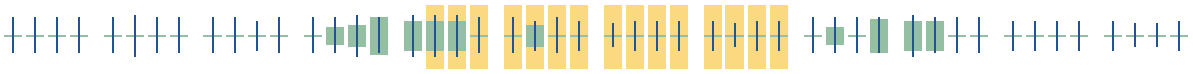
To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



Wood Thrush
BCC Rangewide
(CON)



Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets.

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering or migrating in my area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may query your location using the RAIL Tool and look at the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird

on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key

component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

There are no refuge lands at this location.

Fish hatcheries

There are no fish hatcheries at this location.

Wetlands in the National Wetlands Inventory (NWI)

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Wetland information is not available at this time

This can happen when the National Wetlands Inventory (NWI) map service is unavailable, or for very large projects that intersect many wetland areas. Try again, or visit the NWI map to view wetlands at this location.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate Federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

NOTE: ***The following Property Assessment and Warranty is provided by the U.S. Army Corps of Engineers, Nashville District, as a standard template document for compensatory mitigation projects. The Property Assessment and Warranty must be completed and returned to the Corps with all attachments included after a public notice has been issued for the permit application, mitigation bank prospectus or in-lieu fee project proposal, or, if public notice is not required, upon receipt of a proposed detailed mitigation plan. The Property Assessment and Warranty, including the attachments and documents incorporated by reference in it and any amendments thereto, must be attached as an exhibit to the final mitigation plan or mitigation banking instrument, as applicable. Any modifications to this template must be identified using track changes or other electronic comparison and explained in an attached addendum. This template should not be construed or relied upon as legal advice or opinion on any specific facts or circumstances. (Template Version Date: January 29, 2018)***

PROPERTY ASSESSMENT AND WARRANTY

This Property Assessment and Warranty ("Property Assessment") is made as of this ___ day of _____, 20__, by ***Metropolitan Government of Nashville and Davidson County, Tennessee,*** ("Property Owner"), for the benefit of the Nashville District of the U.S. Army Corps of Engineers ("Corps"). Property Owner acknowledges that this Property Assessment and the statements in it may be conclusively relied upon by the Corps in approving the permit application for the _____ Project.

This Property Assessment provides a summary and explanation of each recorded or unrecorded lien or encumbrance on, or interest in, the Protected Property (as defined below), including, without limitation, each exception listed in the Preliminary Report issued by ***Signature Title Services, LLC***, ***April 9, 2024***, (the "Preliminary Report"), covering the Protected Property, as described in **Attachments 1 and 2** attached hereto and incorporated by this reference. Specifically, this Property Assessment includes a narrative explaining each lien, encumbrance, interest or other exception to title and the manner in which it may affect the conservation easement to be recorded against the Protected Property (the "Conservation Easement") pursuant to the approved mitigation plan.

Property Owner covenants, represents, and warrants to the Corps as follows:

1. Property Owner is the sole owner in fee simple of certain real property containing approximately 336.43 acres located at ***2009 Sevier St., Nashville, TN 37206*** in Davidson County, State of Tennessee, designated as Assessor's Parcel Number(s) ***09402022900*** (the"Protected Property"), as legally described in the Preliminary Report. Property Owner has, and, upon the recordation of the Conservation Easement, Property Owner will have, good, marketable and indefeasible fee simple title to the Protected Property subject only to any exceptions approved in advance of recordation, in writing, by the Corps.
2. The Protected Property is available to be burdened by the Conservation Easement for the conservation purposes identified in the Conservation Easement, in accordance with the approved mitigation plan.
3. The Protected Property includes legal access to and from ***Sevier St.***
4. A true, accurate and complete listing and explanation of each recorded or unrecorded lien or

encumbrance on, or possessory or non-possessory interest in, the Protected Property is set forth in **Attachment 3**, attached to and incorporated by reference in this Property Assessment. Except as disclosed in **Attachment 3**, there are no outstanding mortgages, liens, encumbrances or other interests in the Protected Property (including, without limitation, mineral interests). **Attachment 4**, attached hereto and incorporated in this Property Assessment by reference, depicts all relevant and plottable property lines, easements, dedications, etcetera, on the Protected Property.

5. Prior to recordation of the Conservation Easement, Property Owner will certify to the Corps in writing that this Property Assessment remains true, accurate and complete in all reports.
6. Property Owner has no knowledge or notice of any legal or other restrictions upon the use of the Protected Property for conservation purposes, or affecting its Conservation Values, as described in the Conservation Easement, or any other matters that may adversely affect title to the Protected Property or interfere with the establishment of a mitigation project thereon.
7. Property Owner has not granted any options, or committed or obligated to sell the Protected Property or any portion thereof, except as disclosed in writing to and agreed upon in writing by the Corps.
8. The following attachments are incorporated by reference in this Property Assessment.
   a. Attachment 1 – Preliminary Report;
   b. Attachment 2 – Encumbrance Documents;
   c. Attachment 3 – Summary and Explanation of Encumbrances; and
   d. Attachment 4 – Map(s)

PROPERTY OWNER

_____ _____

Metropolitan Government of Nashville and Davidson County, Tennessee.
By:
Its:

Date

STATE OF _____
COUNTY OF _____

Personally appeared before me, the undersigned, a Notary Public in and for said County and State, the within named _____**,** with whom I am personally acquainted, (or proved to me on the basis of satisfactory evidence) and who acknowledged that they executed the within instrument for the purposes therein contained, and who further acknowledged that they are the _____ of The Metropolitan Government of Nashville and Davidson County, Tennessee, and is authorized to execute the within instrument on its behalf.

Witness my hand and seal at office on this, the _____ day of _____, 2024.

My commission expires: _____

_____
NOTARY PUBLIC

ATTACHMENT 3

MONETARY LIENS
None.

EASEMENTS AND RIGHTS OF WAY

- Preliminary Report Exception or Exclusion No.: v
- Date: 7/9/1914
- Grantor: J.P. Merideith
- Grantee: City of Nashville
- Holder (if different than Grantee): Metropolitan Government of Nashville and Davidson County, Tennessee.
- Description: Roadway Strip.
- Analysis: No Affect.
- 0.00 acres of Protected Property subject to easement
- 336.43 acres of Protected Property *not* subject to easement

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- Preliminary Report Exception or Exclusion No.: vi
- Date: 11/26/1940
- Grantor: Board of Park Commissioners
- Grantee: City of Nashville
- Holder (if different than Grantee): Metropolitan Government of Nashville and Davidson County, Tennessee.
- Description: Sewer Easement
- Analysis: No Affect.
- Unknown acres of Protected Property subject to easement
- Unknown acres of Protected Property *not* subject to easement

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- Preliminary Report Exception or Exclusion No.: vii
- Date: 11/26/1940
- Grantor: Board of Park Commissioners
- Grantee: City of Nashville
- Holder (if different than Grantee): Metropolitan Government of Nashville and Davidson County, Tennessee.
- Description: Sewer Easement
- Analysis: No Affect.
- Unknown acres of Protected Property subject to easement
- Unknown acres of Protected Property *not* subject to easement

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- Preliminary Report Exception or Exclusion No.: viii
- Date: 1/16/1958
- Grantor: Board of Park Commissioners
- Grantee: City of Nashville
- Holder (if different than Grantee): Metropolitan Government of Nashville and Davidson County, Tennessee.
- Description: Sewer Easement
- Analysis: No Affect.
- Unknown acres of Protected Property subject to easement
- Unknown acres of Protected Property *not* subject to easement

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- Preliminary Report Exception or Exclusion No.: ix
- Date: 5/23/1958
- Grantor: Board of Park Commissioners
- Grantee: City of Nashville
- Holder (if different than Grantee): Metropolitan Government of Nashville and Davidson County, Tennessee.
- Description: Sewer Easement
- Analysis: No Affect.
- Unknown acres of Protected Property subject to easement
- Unknown acres of Protected Property *not* subject to easement

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- Preliminary Report Exception or Exclusion No.: x
- Date: 12/14/1962
- Grantor: Nashville Park Board, City of Nashville, Tennessee
- Grantee: City of Nashville
- Holder (if different than Grantee): Metropolitan Government of Nashville and Davidson County, Tennessee.
- Description: Sewer Easement
- Analysis: No Affect.
- Unknown acres of Protected Property subject to easement
- Unknown acres of Protected Property *not* subject to easement

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- Preliminary Report Exception or Exclusion No.: xi
- Date: 12/14/1962
- Grantor: Nashville Park Board
- Grantee: City of Nashville
- Holder (if different than Grantee): Metropolitan Government of Nashville and Davidson County, Tennessee.
- Description: Sewer Easement
- Analysis: No Affect.
- Unknown acres of Protected Property subject to easement
- Unknown acres of Protected Property *not* subject to easement

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- Preliminary Report Exception or Exclusion No.: xii
- Date: 3/6/1963
- Grantor: Board of Park Commissioners
- Grantee: City of Nashville
- Holder (if different than Grantee): Metropolitan Government of Nashville and Davidson County, Tennessee.
- Description: Sewer Easement
- Analysis: No Affect.
- Unknown acres of Protected Property subject to easement
- Unknown acres of Protected Property *not* subject to easement

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- Preliminary Report Exception or Exclusion No.: xiii
- Date: 3/6/1963
- Grantor: Board of Park Commissioners
- Grantee: City of Nashville
- Holder (if different than Grantee): Metropolitan Government of Nashville and Davidson County, Tennessee.
- Description: Sewer Easement
- Analysis: No Affect.
- Unknown acres of Protected Property subject to easement
- Unknown acres of Protected Property *not* subject to easement

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- Preliminary Report Exception or Exclusion No.: xiv
- Date: 3/29/1963
- Grantor: Board of Park Commissioners
- Grantee: City of Nashville
- Holder (if different than Grantee): Metropolitan Government of Nashville and Davidson County, Tennessee.
- Description: Sewer Easement
- Analysis: No Affect.
- Unknown acres of Protected Property subject to easement
- Unknown acres of Protected Property *not* subject to easement

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- Preliminary Report Exception or Exclusion No.: xv
- Date: 4/11/1955
- Grantor: Board of Park Commissioners
- Grantee: Waterworks Department of the City of Nashville
- Holder (if different than Grantee): Metropolitan Government of Nashville and Davidson County, Tennessee.
- Description: Water Main Easement
- Analysis: No Affect.
- Unknown acres of Protected Property subject to easement
- Unknown acres of Protected Property *not* subject to easement

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- Preliminary Report Exception or Exclusion No.: xvi
- Date: 9/26/1961
- Grantor: Metro Council
- Grantee: Nashville Gas Company
- Holder (if different than Grantee): Piedmont Natural Gas Company, Inc.
- Description: Gas Line Easement
- Analysis: No Affect.
- Unknown acres of Protected Property subject to easement
- Unknown acres of Protected Property *not* subject to easement

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- Preliminary Report Exception or Exclusion No.: xvii
- Date: 3/6/1963
- Grantor: Board of Park Commissioners
- Grantee: Nashville Gas Company
- Holder (if different than Grantee): Piedmont Natural Gas Company, Inc.
- Description: Gas Line Easement
- Analysis: No Affect.
- Unknown acres of Protected Property subject to easement
- Unknown acres of Protected Property *not* subject to easement

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- Preliminary Report Exception or Exclusion No.: xviii
- Date: 9/9/1968
- Grantor: Board of Park Commissioners
- Grantee: Metropolitan Government of Nashville and Davidson County, Tennessee.
- Holder (if different than Grantee): N/A
- Description: Water Main Easement
- Analysis: No Affect.
- Unknown acres of Protected Property subject to easement
- Unknown acres of Protected Property *not* subject to easement

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- Preliminary Report Exception or Exclusion No.: xix
- Date: 3/23/1998
- Grantor: Metropolitan Government of Nashville and Davidson County, Tennessee.
- Grantee: Metropolitan Government of Nashville and Davidson County, Tennessee.
- Holder (if different than Grantee): N/A
- Description: Sewer/Storm Drainage Easement
- Analysis: No Affect.
- Unknown acres of Protected Property subject to easement
- Unknown acres of Protected Property *not* subject to easement

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- Preliminary Report Exception or Exclusion No.: xx
- Date: 5/18/2012
- Grantor: Metro Board of Parks and Recreation
- Grantee: Metropolitan Government of Nashville and Davidson County, Tennessee.
- Holder (if different than Grantee): N/A
- Description: Sewer/Storm Drainage Easement/Restrictions
- Analysis: No Affect.
- Unknown acres of Protected Property subject to easement
- Unknown acres of Protected Property *not* subject to easement

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- Preliminary Report Exception or Exclusion No.: xxi
- Date: 7/23/2020
- Grantor: Metropolitan Government of Nashville and Davidson County, Tennessee.
- Grantee: Piedmont Natural Gas Company, Inc.
- Holder (if different than Grantee): N/A
- Description: Gas Line Easement
- Analysis: No Affect.
- Unknown acres of Protected Property subject to easement
- Unknown acres of Protected Property *not* subject to easement

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- Preliminary Report Exception or Exclusion No.: xxii
- Date: 5/16/1911
- Grantor: J.P. Meredith
- Grantee: Louisville & Nashville Railroad Company
- Holder (if different than Grantee): N/A
- Description: easement
- Analysis: No Affect.
- Unknown acres of Protected Property subject to easement
- Unknown acres of Protected Property *not* subject to easement

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- Preliminary Report Exception or Exclusion No.: xxiii
- Date: 7/5/1912
- Grantor: P.P. McWhirter, Chairman of the Board of Park Commissioners of Nashville, Tenn.
- Grantee: Lewisburg Northern Railroad Company
- Holder (if different than Grantee): N/A
- Description: easement
- Analysis: No Affect.
- 1.52 acres of Protected Property subject to easement
- 334.91 acres of Protected Property *not* subject to easement

LEASES

None.

COVENANTS, CONDITIONS, RESTRICTIONS AND RESERVATIONS

- Preliminary Report Exception or Exclusion No.: xxiv
- Dated: N/A
- Grantor or Declarant: N/A
- Grantee (if applicable): N/A
- Description: Rights of others in and to the use of the navigable waters of the Cumberland River located on the premises and the natural flow thereof.
- Analysis: No affect.
- 336.43 acres of Protected Property subject to exception/exclusion
- 0.00 acres of Protected Property *not* subject to exception/exclusion

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- Preliminary Report Exception or Exclusion No.: xxv
- Dated: N/A
- Grantor or Declarant: N/A
- Grantee (if applicable): N/A
- Description: Any enlargement or loss of land by reason of accretion, reliction, avulsion or erosion.
- Analysis: No affect.
- 336.43 acres of Protected Property subject to exception/exclusion
- 0.00 acres of Protected Property *not* subject to exception/exclusion

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- Preliminary Report Exception or Exclusion No.: xxvi
- Dated: 5/18/2015
- Grantor or Declarant: Metropolitan Government of Nashville and Davidson County, Tennessee.
- Grantee (if applicable): N/A
- Description: Ordinance No. BL2015-1187. An Ordinance to amend Title 17 of the Metropolitan Code of Laws, the Zoning Ordinance of the Metropolitan Government of Nashville and Davidson County, by applying a Historic Landmark Overlay District to property located at 2009 Sevier Street, approximately 540 feet east of S. 14th Street (336.43 acres), zoned R6, RSS, and RS7.6, all of which is described herein (Proposal No. 2015HL-002-001).
- Analysis: No affect.
- 336.43 acres of Protected Property subject to exception/exclusion
- 0.00 acres of Protected Property *not* subject to exception/exclusion

<u>OTHER INTERESTS (INCLUDING MINERAL OR OTHER SEVERED INTERESTS)</u>
None.