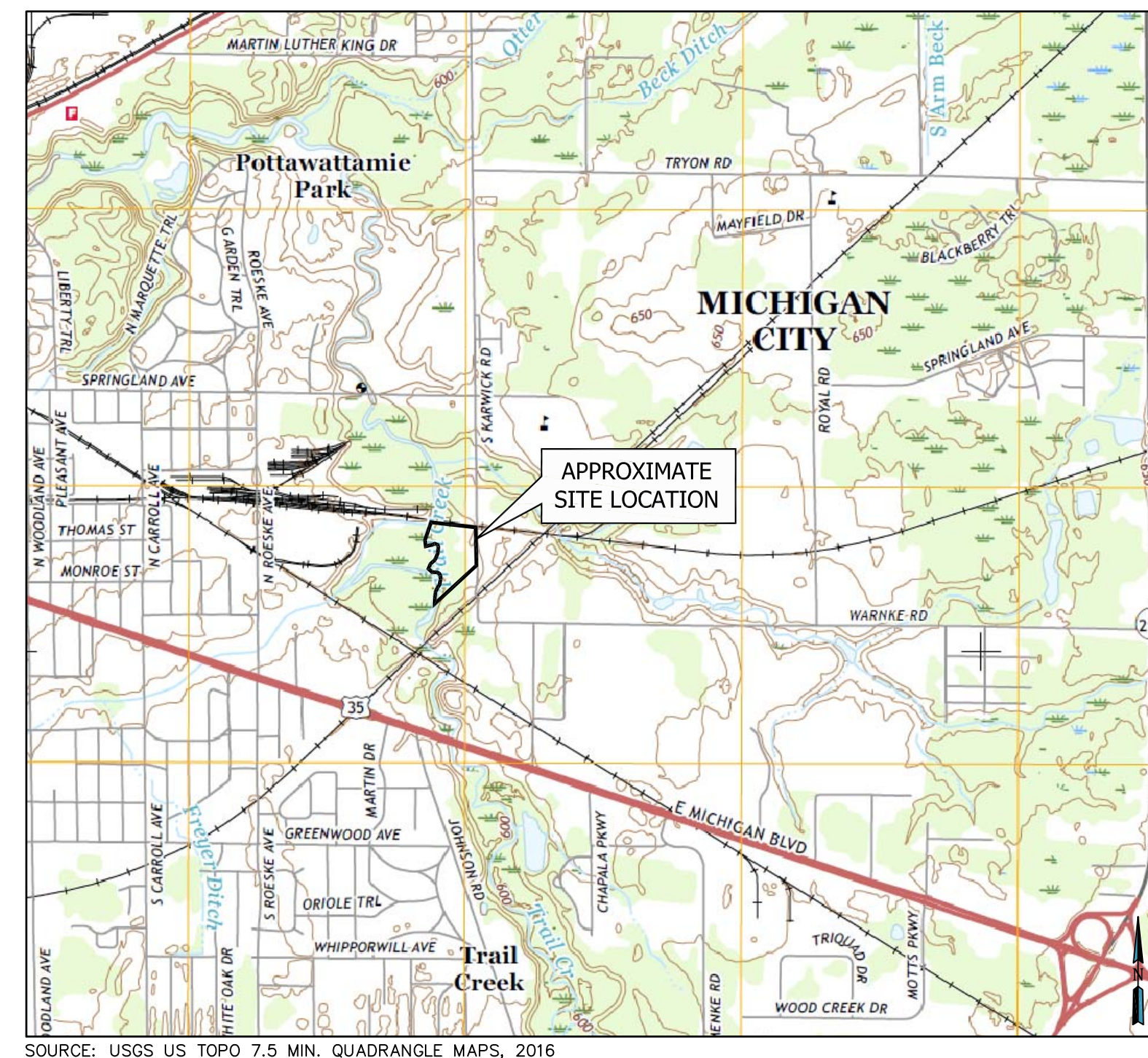


PLANS FOR THE  
**CORRECTIVE ACTION**  
**KARWICK NATURE PARK**  
MICHIGAN CITY SANITARY DISTRICT

MICHIGAN CITY, INDIANA  
MARCH 2019



## SITE LOCATION

NOT TO SCALE

SHEET NO.	TITLE	FILE NAME
1	COVER SHEET AND DRAWING INDEX	KNP0017.DWG
2	EXISTING CONDITIONS	KNP0018.DWG
3	GRADING PLAN - EXCAVATION	KNP0020.DWG
4	GRADING PLAN - BOTTOM OF BANK CLAY	KNP0022.DWG
5	GRADING PLAN - TOP OF BANK CLAY	KNP0024.DWG
6	GRADING PLAN - FINAL	KNP0026.DWG
7	LEACHATE FORCEMAIN PLAN	KNP0027.DWG
8	BANK CROSS SECTIONS	KNP0028.DWG
9	LEACHATE GRAVITY DRAIN PROFILE	KNP0029.DWG
10	PROPOSED LANDSCAPE & PLANTING - 1	KNP0032.DWG
11	PROPOSED LANDSCAPE & PLANTING - 2	KNP0032.DWG
12	NOTES	KNP0030.DWG
13	DETAILS - 1	KNP0030.DWG
14	DETAILS - 2	KNP0030.DWG
15	DETAILS - 3	KNP0030.DWG
16	DETAILS - 4	KNP0030.DWG



**CORRECTIVE ACTION**  
KARWICK NATURE PARK  
MICHIGAN CITY, INDIANA

[illegible]

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Consultants  
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DRAWN BY:	BED
DATE:	03/01/2019
PROJECT:	1873-356-DWG
FILE:	KNP0017.dwg
SHEET 1	OF 16







1. EXISTING TOPOGRAPHIC DATA OBTAINED FROM PHOTOGRAMMETRIC METHODS OBTAINED DURING FLIGHT ON APRIL 26, 2017. ALTA/NSPS LAND TITLE SURVEY & TOPOGRAPHIC SURVEY PERFORMED BY WEAVER CONSULTANTS GROUP. DATE OF DRAWING 05/26/2017. ADDITIONAL FIELD SURVEY OF RIGHT-OF-WAY PERFORMED BY WEAVER CONSULTANTS GROUP ON MARCH 23, 2018.
2. FLOOD ZONE APPROXIMATED FROM FEMA FLOOD INSURANCE RATE MAP #18091C01280, EFFECTIVE DATE 11/06/2013, BASE FLOOD ELEVATION 599' TO 601'.
3. CONTRACTOR SHALL LOCATE ALL UTILITIES PRIOR TO EXCAVATION.
4. CUT EXISTING PIPE BACK BEHIND EXCAVATION SLOPE. FILL REMAINING PIPE TO THE EXTENT POSSIBLE WITH FLOWABLE LOW STRENGTH CONCRETE.
5. SEE SHEET 12 FOR ADDITIONAL NOTES.



**GRADING PLAN - EXCAVATION  
CORRECTIVE ACTION**  
KARWICK NATURE PARK  
MICHIGAN CITY, INDIANA

DISTURBED AREA SUMMARY			
	AREA (AC)	VOLUME (CY)	VOLUME (CY) FLOODWAY ONLY
BANK EXCAVATION	1.99	13,399	12,720 <CUT>
PARK EXCAVATION FOR WESTWARD STORM WATER DRAINAGE	2.23	5,507	4,399 <CUT>
TOTAL EXCAVATION	4.22	18,906	17,199 <CUT>



**GRADING PLAN - BOTTOM OF BANK CLAY  
CORRECTIVE ACTION**  
KARWICK NATURE PARK  
MICHIGAN CITY, INDIANA

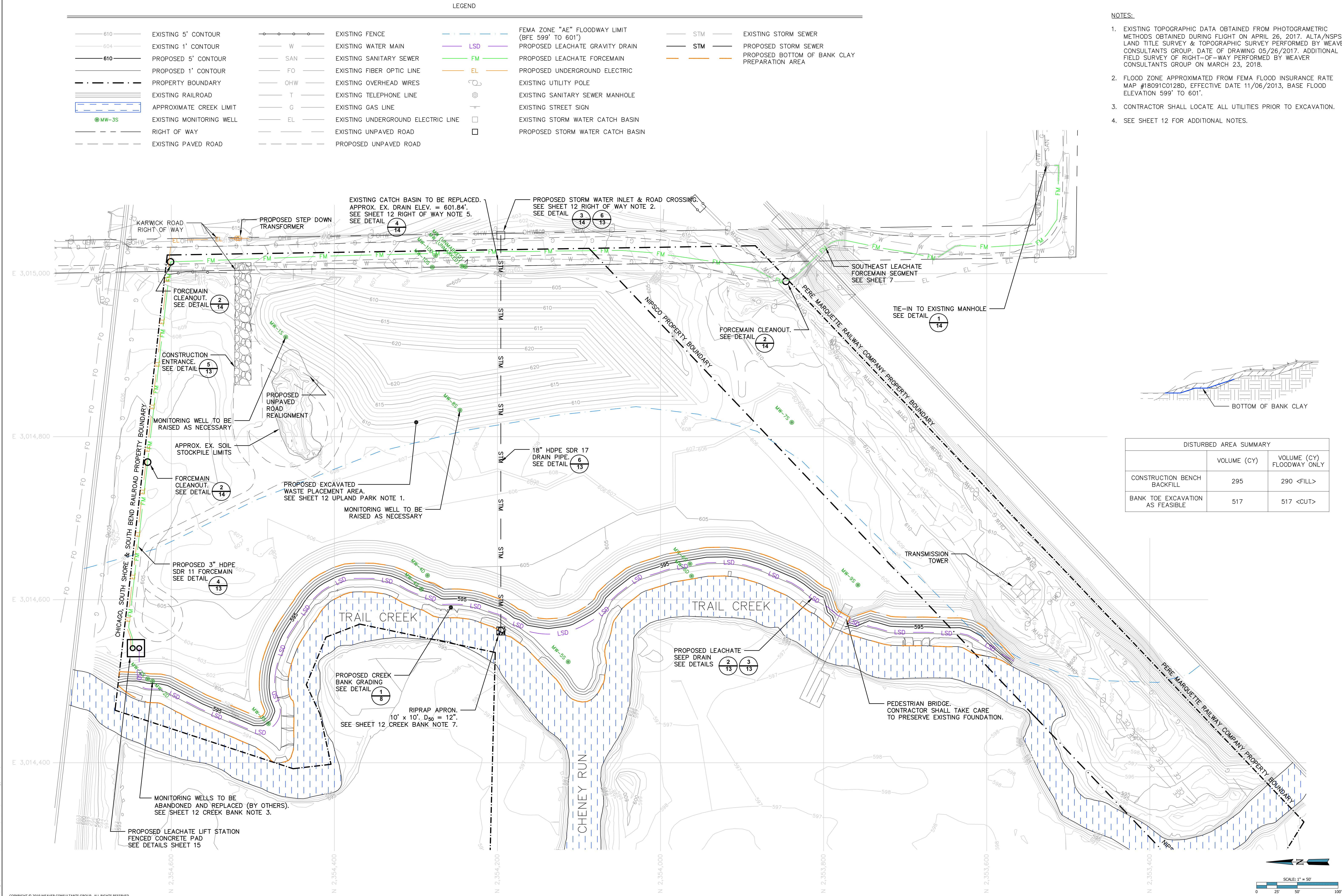
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DATE:	03/01/201
FILE:	1873-356-DW
CAD:	KNP0022.dwg

SHEET 4



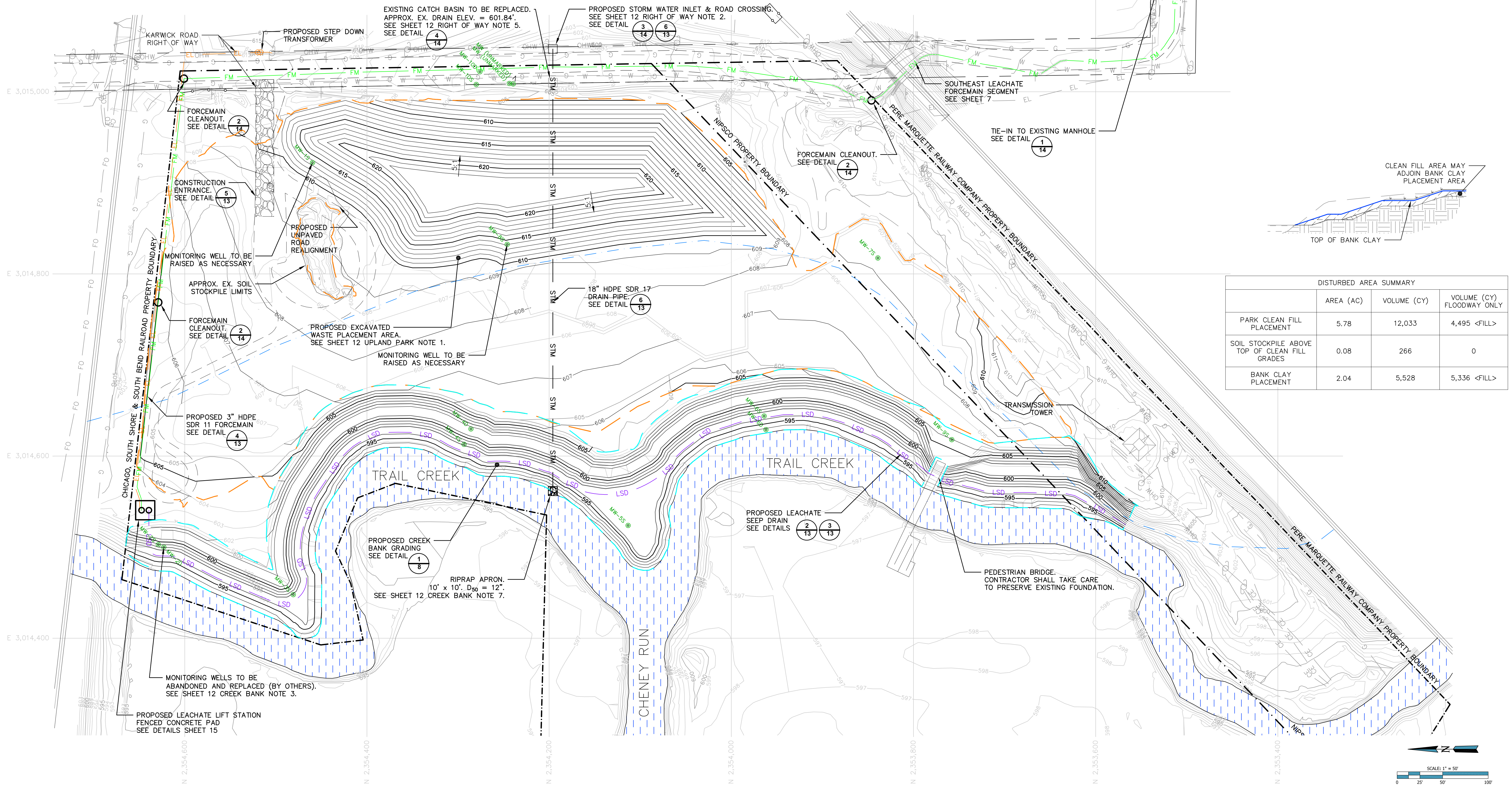


## LEGEND

610	EXISTING 5' CONTOUR	EXISTING FENCE	FEMA ZONE "AE" FLOODWAY LIMIT (BFE 599' TO 601')	STM	EXISTING STORM SEWER
604	EXISTING 1' CONTOUR	W	PROPOSED LEACHATE GRAVITY DRAIN	STM	PROPOSED STORM SEWER
610	PROPOSED 5' CONTOUR	SAN	PROPOSED LEACHATE FORCEMAIN		PROPOSED CLEAN FILL PLACEMENT AREA
	PROPOSED 1' CONTOUR	FO	PROPOSED UNDERGROUND ELECTRIC		PROPOSED BANK CLAY PLACEMENT AREA
- - - - -	PROPERTY BOUNDARY	OHW	EXISTING UTILITY POLE		
	EXISTING RAILROAD	T	EXISTING SANITARY SEWER MANHOLE		
	APPROXIMATE CREEK LIMIT	G	EXISTING STREET SIGN		
● MW-3S	EXISTING MONITORING WELL	EL	EXISTING STORM WATER CATCH BASIN		
- - - - -	RIGHT OF WAY		PROPOSED STORM WATER CATCH BASIN		
- - - - -	EXISTING PAVED ROAD				
- - - - -					

## NOTES:

- EXISTING TOPOGRAPHIC DATA OBTAINED FROM PHOTOGRAMETRIC METHODS OBTAINED DURING FLIGHT ON APRIL 26, 2017. ALTA/NISPS LAND TITLE SURVEY & TOPOGRAPHIC SURVEY PERFORMED BY WEAVER CONSULTANTS GROUP. DATE OF DRAWING 05/26/2017. ADDITIONAL FIELD SURVEY OF RIGHT-OF-WAY PERFORMED BY WEAVER CONSULTANTS GROUP ON MARCH 23, 2018.
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- CONTRACTOR SHALL LOCATE ALL UTILITIES PRIOR TO EXCAVATION.
- SEE SHEET 12 FOR ADDITIONAL NOTES.



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GRADING PLAN - TOP OF BANK CLAY  
CORRECTIVE ACTION  
KARWICK NATURE PARK  
MICHIGAN CITY, INDIANA

REVISION DESCRIPTION	DATE	NO.



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DATE: 03/01/2019  
FILE: 1873-356-DWG  
CAD: KNP0024.dwg

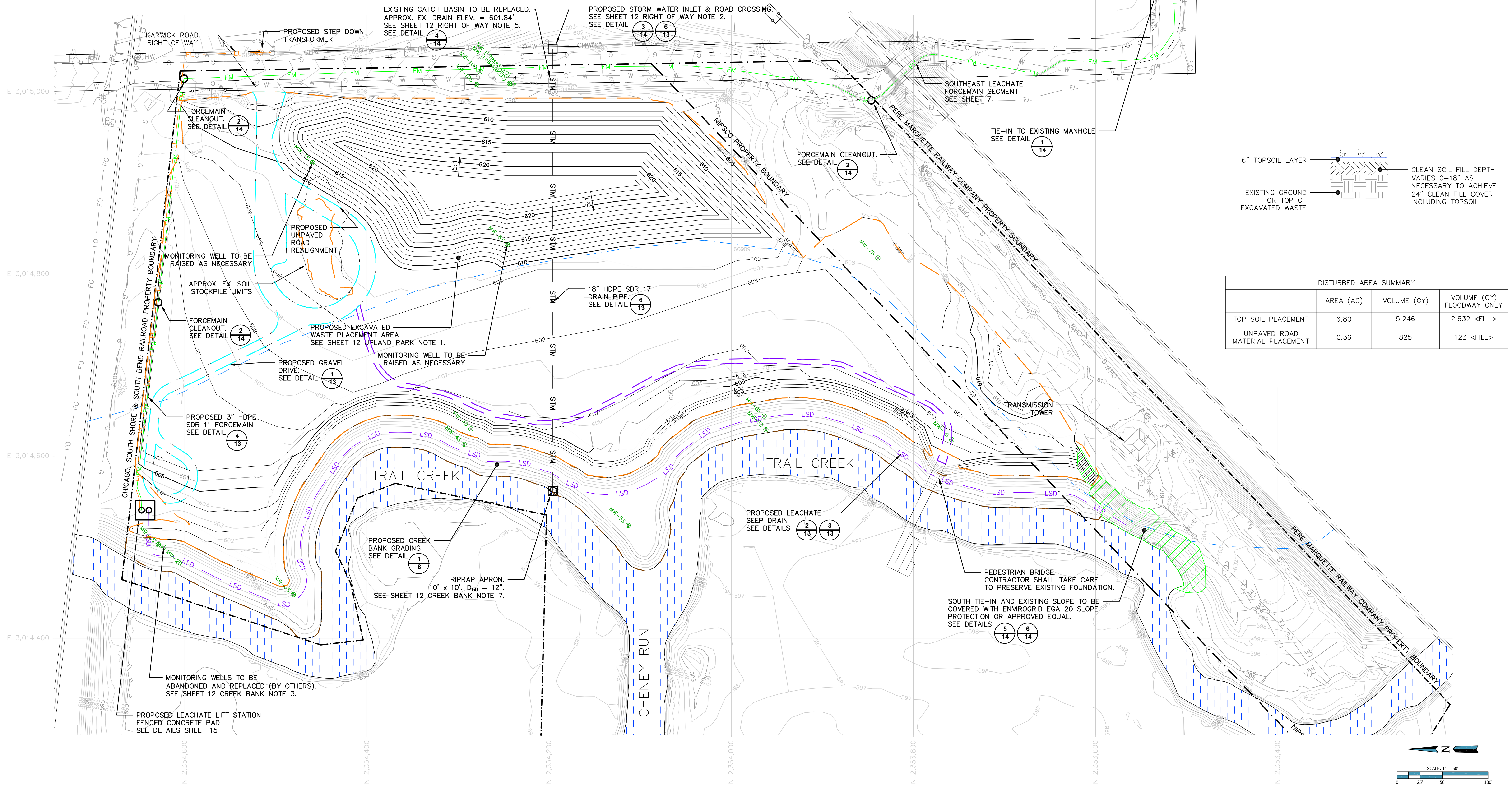


## LEGEND

610	EXISTING 5' CONTOUR	EXISTING FENCE	FEMA ZONE "AE" FLOODWAY LIMIT (BFE 599' TO 601')	STM	EXISTING STORM SEWER
604	EXISTING 1' CONTOUR	W	PROPOSED LEACHATE GRAVITY DRAIN	STM	PROPOSED STORM SEWER
610	PROPOSED 5' CONTOUR	SAN	PROPOSED LEACHATE FORCEMAIN		PROPOSED TOP SOIL PLACEMENT AREA
	PROPOSED 1' CONTOUR	FO	PROPOSED UNDERGROUND ELECTRIC		PROPOSED UNPAVED ROAD AREA
- - - - -	PROPERTY BOUNDARY	OHW	EXISTING UTILITY POLE		PROPOSED VEGETATIVE CLEARING
	EXISTING RAILROAD	T	EXISTING SANITARY SEWER MANHOLE		PROPOSED EXTENT OF SHOESOX
	APPROXIMATE CREEK LIMIT	G	EXISTING STREET SIGN		
● MW-3S	EXISTING MONITORING WELL	EL	EXISTING UNDERGROUND ELECTRIC LINE		
- - - - -	RIGHT OF WAY		EXISTING STORM WATER CATCH BASIN		
- - - - -	EXISTING PAVED ROAD		PROPOSED STORM WATER CATCH BASIN		

## NOTES:

- EXISTING TOPOGRAPHIC DATA OBTAINED FROM PHOTOGRAMETRIC METHODS OBTAINED DURING FLIGHT ON APRIL 26, 2017. ALTA/NSPS LAND TITLE SURVEY & TOPOGRAPHIC SURVEY PERFORMED BY WEAVER CONSULTANTS GROUP. DATE OF DRAWING 05/26/2017. ADDITIONAL FIELD SURVEY OF RIGHT-OF-WAY PERFORMED BY WEAVER CONSULTANTS GROUP ON MARCH 23, 2018.
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- CONTRACTOR SHALL LOCATE ALL UTILITIES PRIOR TO EXCAVATION.
- SEE SHEET 12 FOR ADDITIONAL NOTES.



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GRADING PLAN - FINAL  
CORRECTIVE ACTION  
KARWICK NATURE PARK  
MICHIGAN CITY, INDIANA

REVISION DESCRIPTION	DATE
No.	

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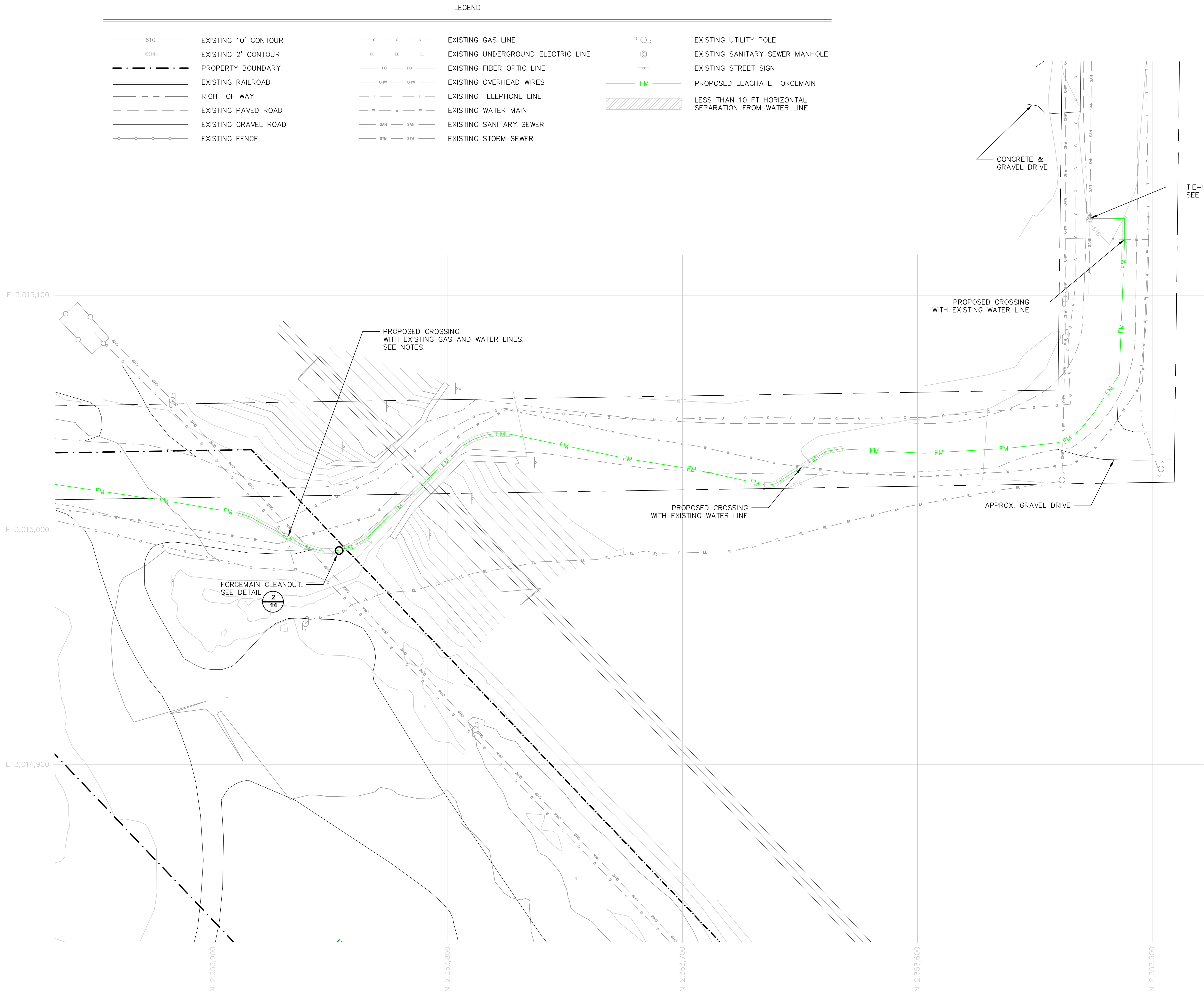
DRAWN BY: JAM  
REVIEWED BY: BED  
DATE: 03/01/2019  
FILE: 1873-356-DWG  
CAD: KNP0026.dwg

SHEET 6 OF 16



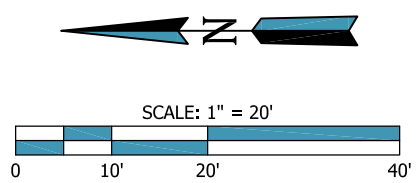
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NOTES:

- EXISTING TOPOGRAPHIC DATA OBTAINED FROM PHOTOGRAMETRIC METHODS OBTAINED DURING FLIGHT ON APRIL 26, 2017. ALTA/NSPS LAND TITLE SURVEY & TOPOGRAPHIC SURVEY PERFORMED BY WEAVER CONSULTANTS GROUP. DATE OF DRAWING 05/26/2017. ADDITIONAL FIELD SURVEY OF RIGHT-OF-WAY PERFORMED BY WEAVER CONSULTANTS GROUP ON MARCH 23, 2018.
- FLOOD ZONE APPROXIMATED FROM FEMA FLOOD INSURANCE RATE MAP #18091C0128D, EFFECTIVE DATE 11/06/2013. BASE FLOOD ELEVATION 599' TO 601'.
- CONTRACTOR SHALL TAKE ALL PRECAUTIONS AND MEET ALL NIPSCO REQUIREMENTS (INCLUDING OBTAINING ALL REQUIRED APPROVALS) WHEN CROSSING THE EXISTING NIPSCO GAS LINE WITH THE PROPOSED FORCEMAIN LINE.
- THE CONTRACTOR WILL BE ALLOWED TO CLOSE KARWICK ROAD FOR A SHORT PERIOD OF TIME IN ORDER TO EXTEND THE PROPOSE FORCEMAIN UNDER THE RAILROAD BRIDGE AND THROUGH KARWICK ROAD TO THE EXISTING SEWER MANHOLE TIE-IN LOCATION. CONTRACTOR SHALL COORDINATE WITH THE CITY BOARD OF PUBLIC WORKS & SAFETY AND COMPLY WITH ALL SIGNAGE REQUIREMENTS PRIOR TO CLOSING THE ROAD.
- ALL FORCEMAIN INSTALLED WITHIN KARWICK ROAD SHALL BE DIRECTIONALLY DRILLED TO THE EXTENT POSSIBLE TO MINIMIZE KARWICK ROAD CLOSURES.
- CONTRACTOR SHALL OBTAIN PERMIT FROM NIPSCO PRIOR TO CROSSING ANY GAS LINES FOR THE PROJECT.
- SEE SHEET 12 FOR ADDITIONAL NOTES.



<input type="checkbox"/> DRAFT	<input checked="" type="checkbox"/> RELEASED FOR BID	<input type="checkbox"/> APPROVED FOR CONSTRUCTION	<input type="checkbox"/> CLIENT APPROVAL BY: _____
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LEACHATE FORCEMAIN PLAN  
CORRECTIVE ACTION  
KARWICK NATURE PARK  
MICHIGAN CITY, INDIANA

REVISION DESCRIPTION	
No.	DATE

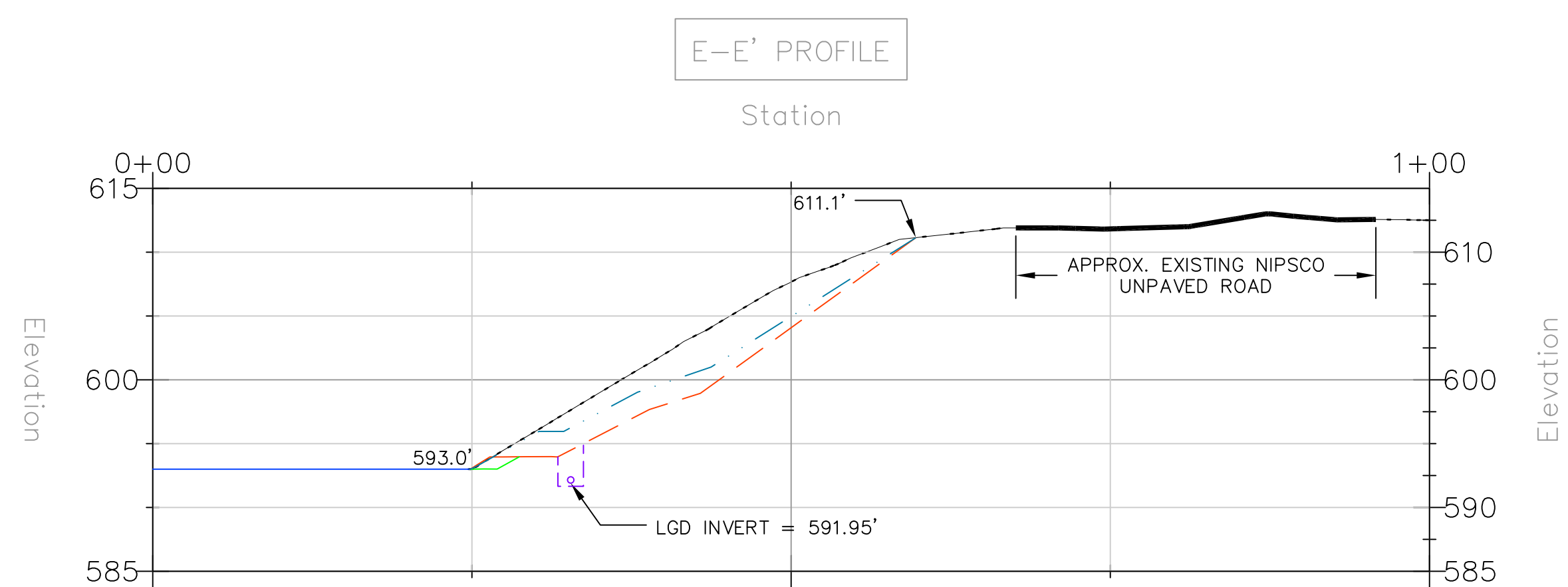
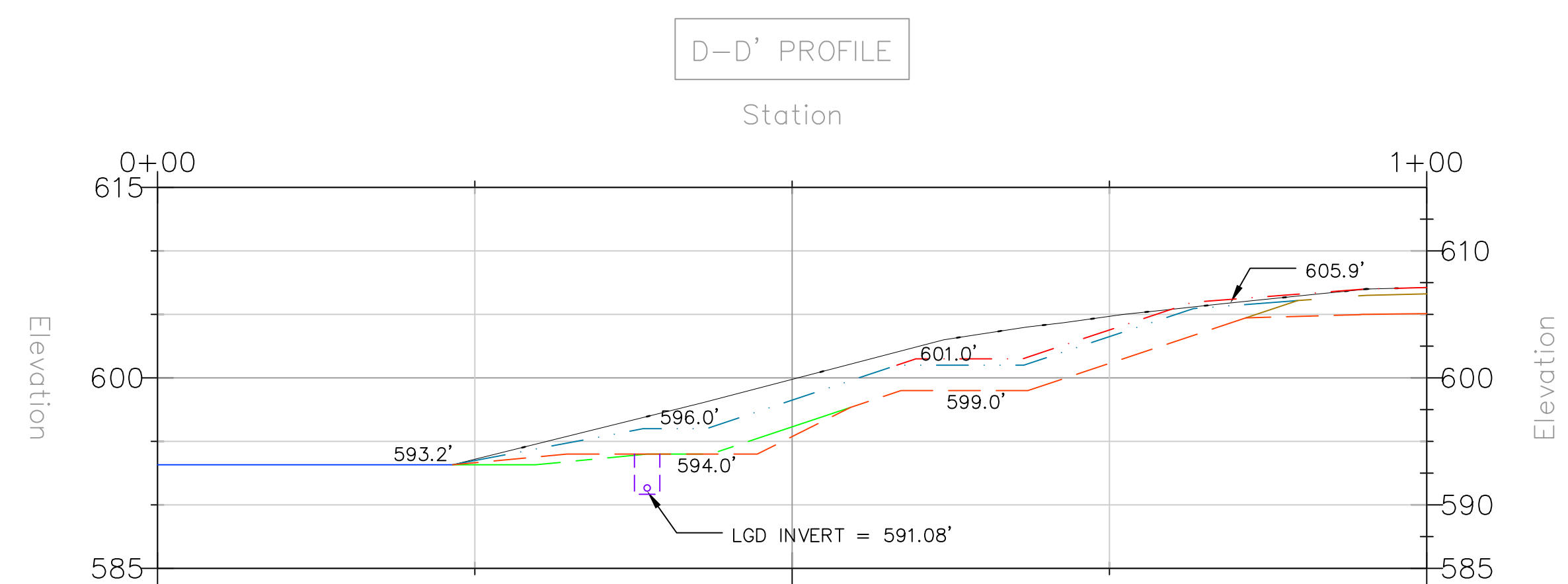
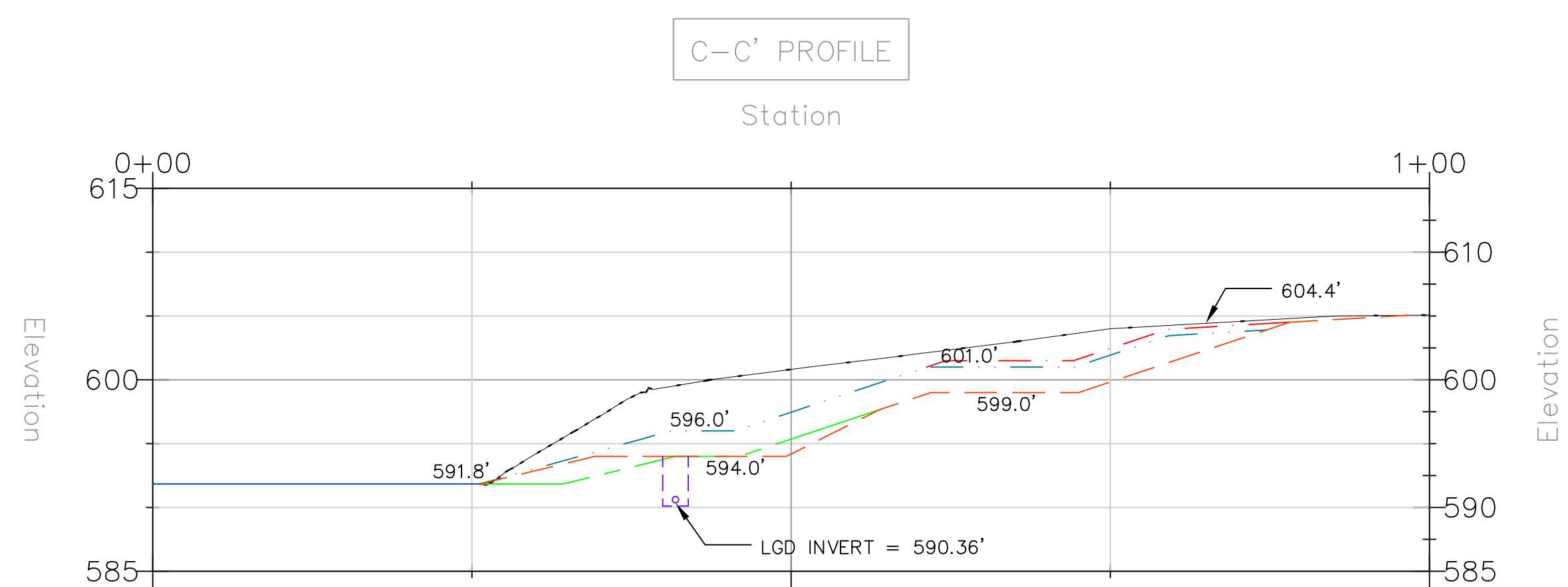
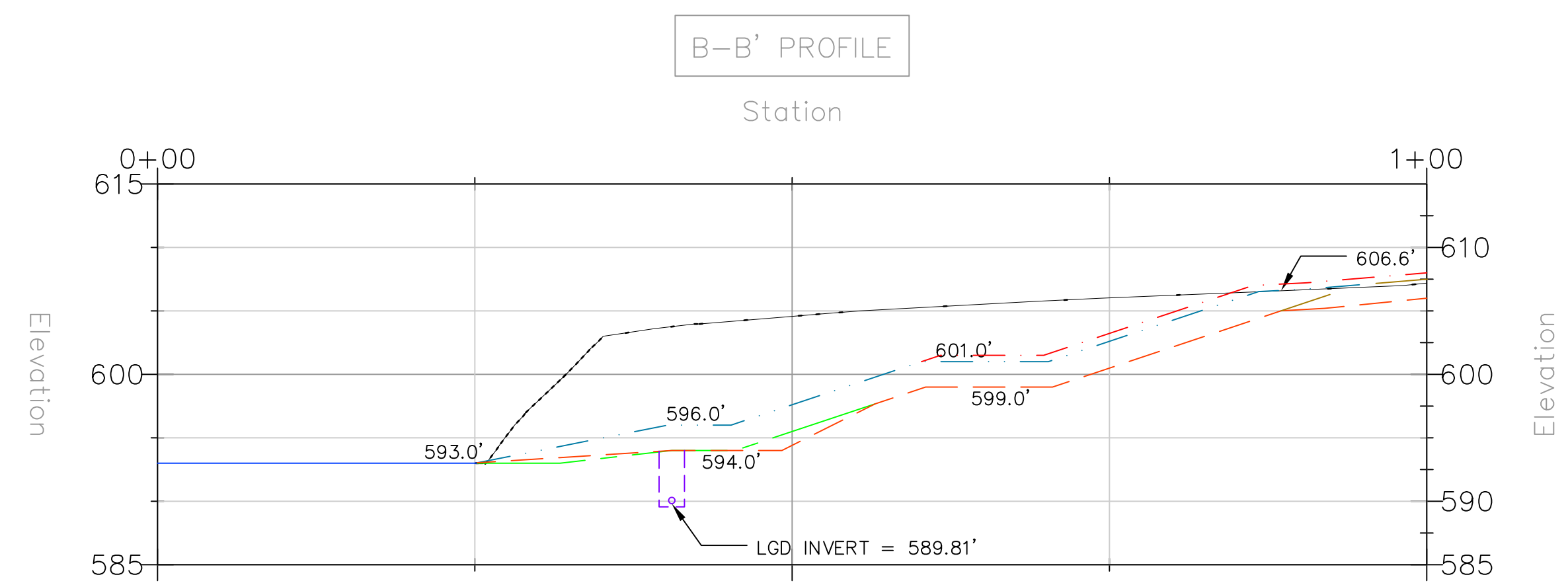
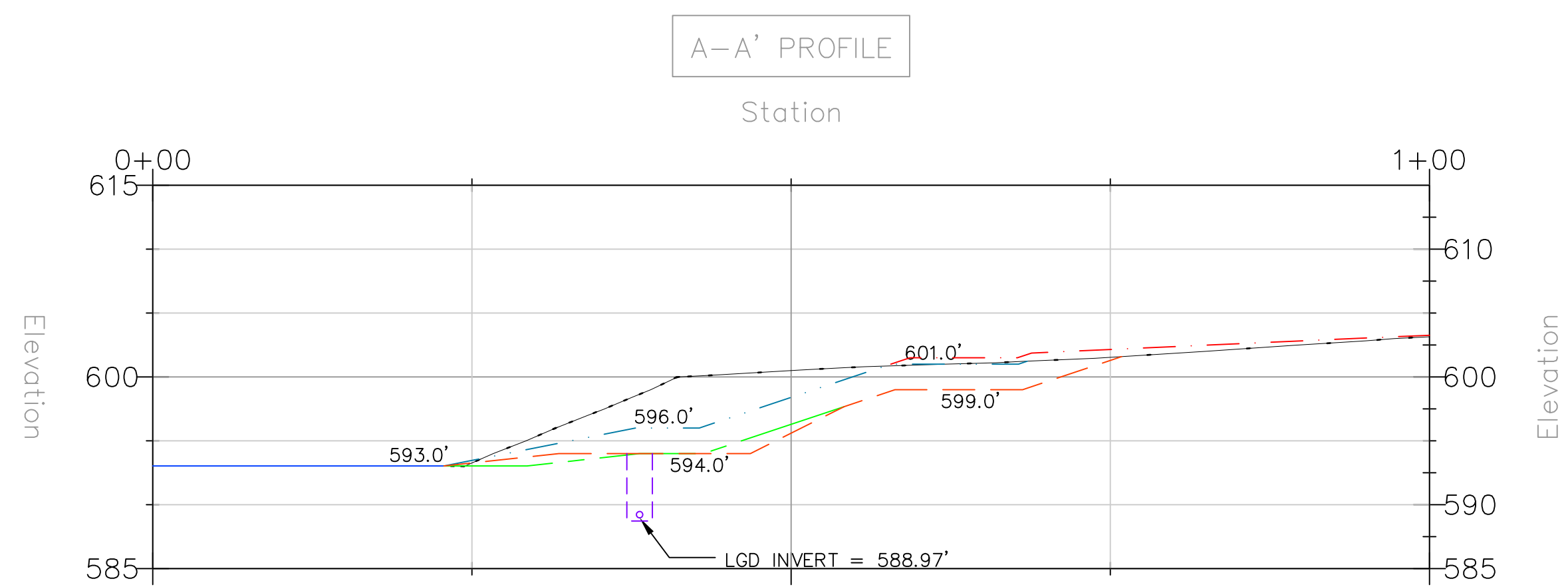
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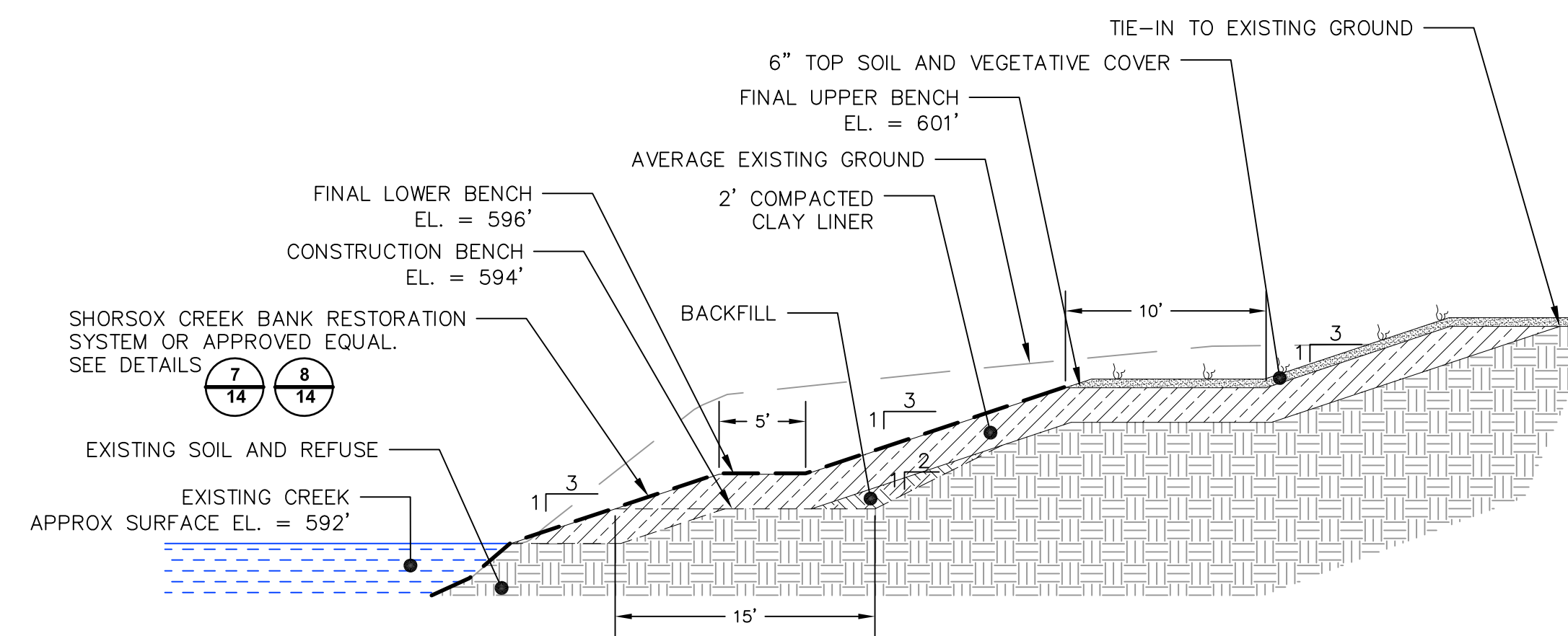
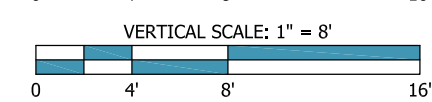
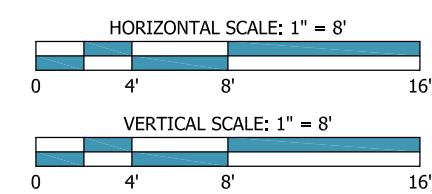
DRAWN BY: JAM  
REVIEWED BY: BED  
DATE: 03/01/2019  
FILE: 1873-356-DWG  
CAD: KNP0027.dwg





NOTE:

AT SOUTH TERMINUS OF LEACHATE GRAVITY DRAIN, BENCHES AND SLOPES  
TAPER OFF TO TIE INTO EXISTING GRADES. EXISTING UTILITY LINES AND  
UNPAVED ROADS ON NIPSCO PROPERTY TO BE PRESERVED.





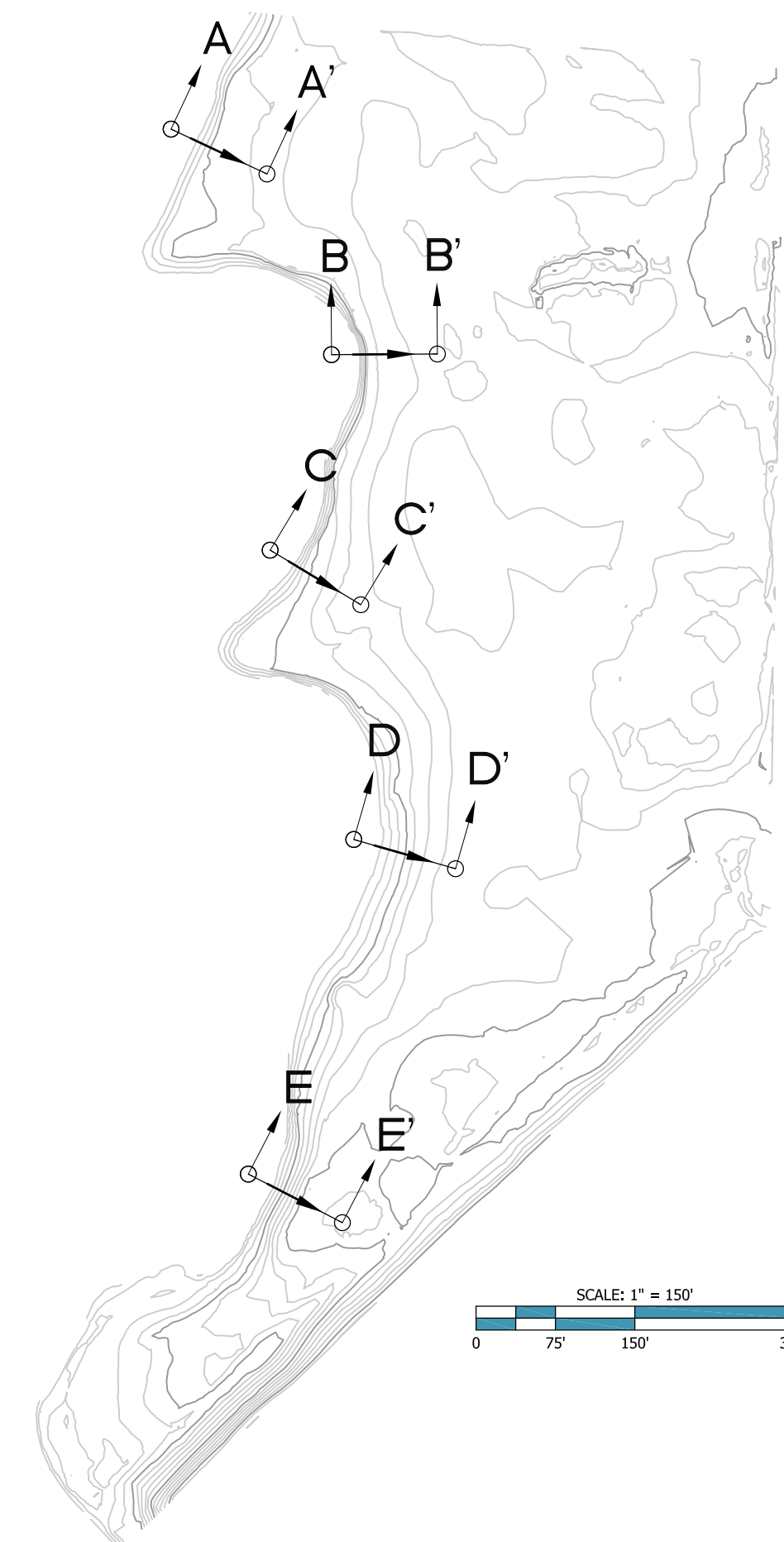
### TYPICAL BANK CROSS SECTION

## DETAIL

**SCALE: NOT TO SCALE**

### LEGEND

- |   |                                     |
|---|-------------------------------------|
|  | EXISTING GRADE                      |
|  | PROPOSED EXCAVATION                 |
|  | PROPOSED BOTTOM OF CLAY GRADE       |
|  | PROPOSED TOP OF CLAY GRADE          |
|  | PROPOSED TOP OF CLEAN FILL GRADE    |
|  | PROPOSED TOP OF TOP SOIL GRADE      |
|  | PROPOSED LEACHATE SEEP DRAIN TRENCH |



SCALE: 1" = 150'

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☐ CLIENT APPROVAL BY: \_\_\_\_\_



**SANITARY  
DISTRICT  
OF MICHIGAN CITY**

**BANK CROSS SECTIONS  
CORRECTIVE ACTION**  
KARWICK NATURE PARK  
MICHIGAN CITY, INDIANA

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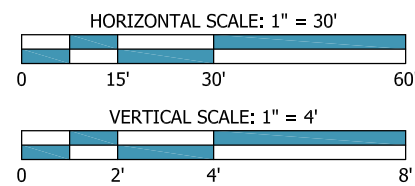
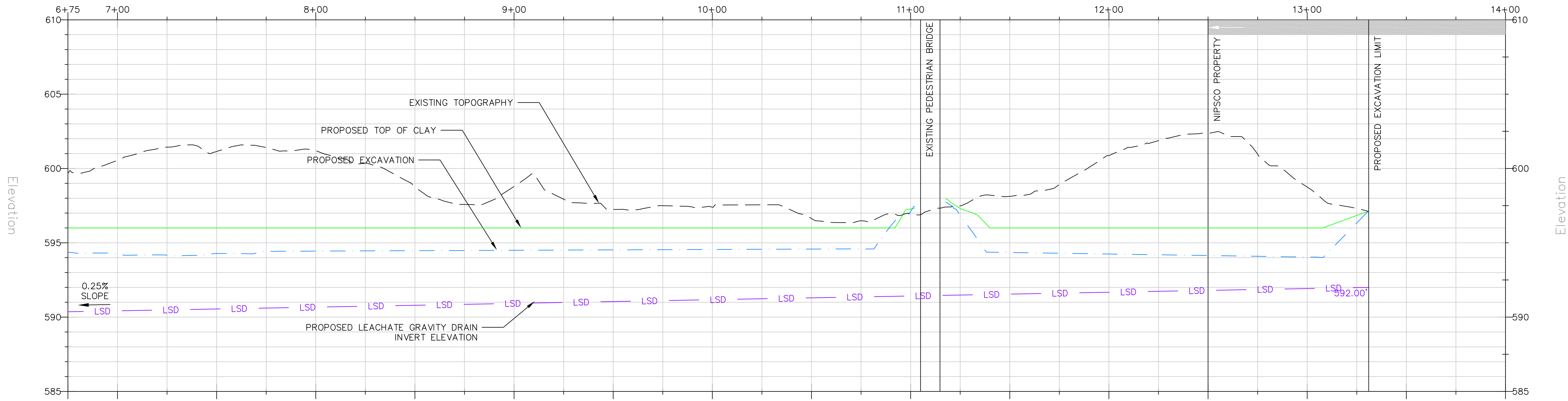
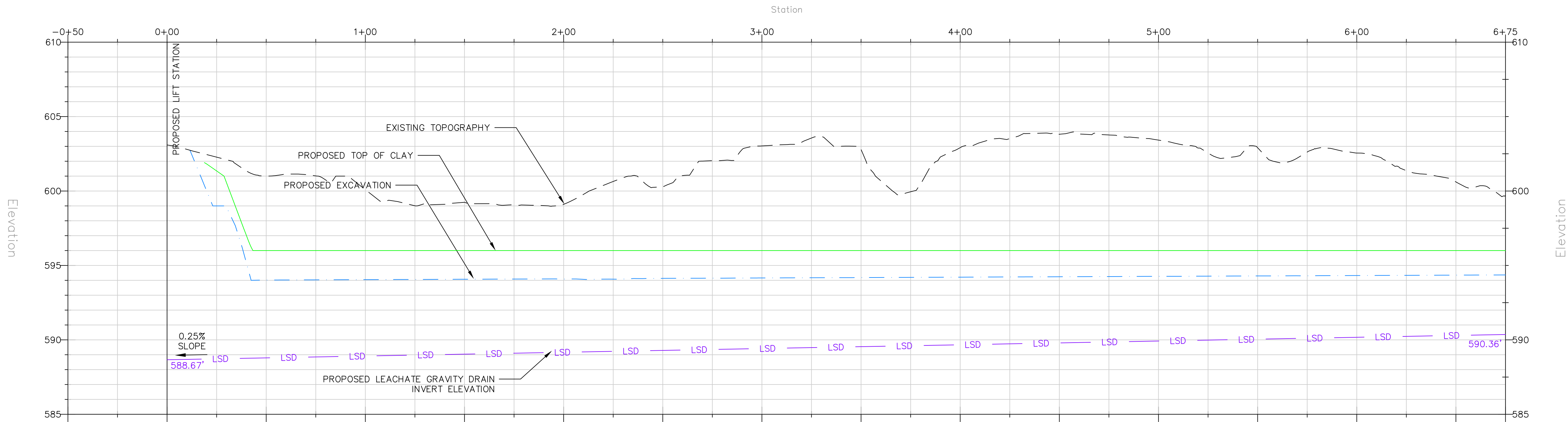
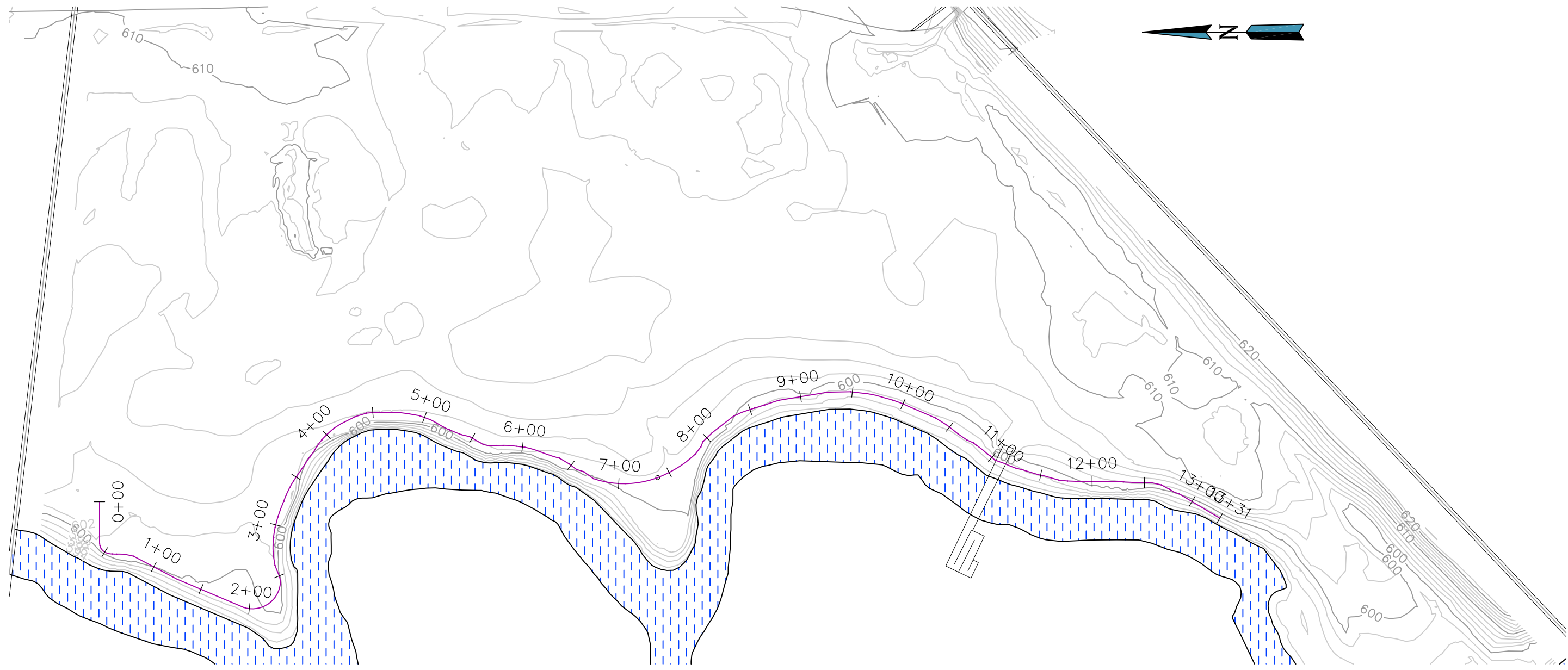
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REVIEWED BY:	BED
DATE:	03/01/2019
FILE:	1873-356-DWC

SHEET 8	Of 16
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LEACHATE GRAVITY DRAIN PROFILE  
CORRECTIVE ACTION  
KARWICK NATURE PARK  
MICHIGAN CITY, INDIANA

No.	DATE	REVISION DESCRIPTION



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FILE: 1873-356-DWG  
CAD: KNP0029.dwg



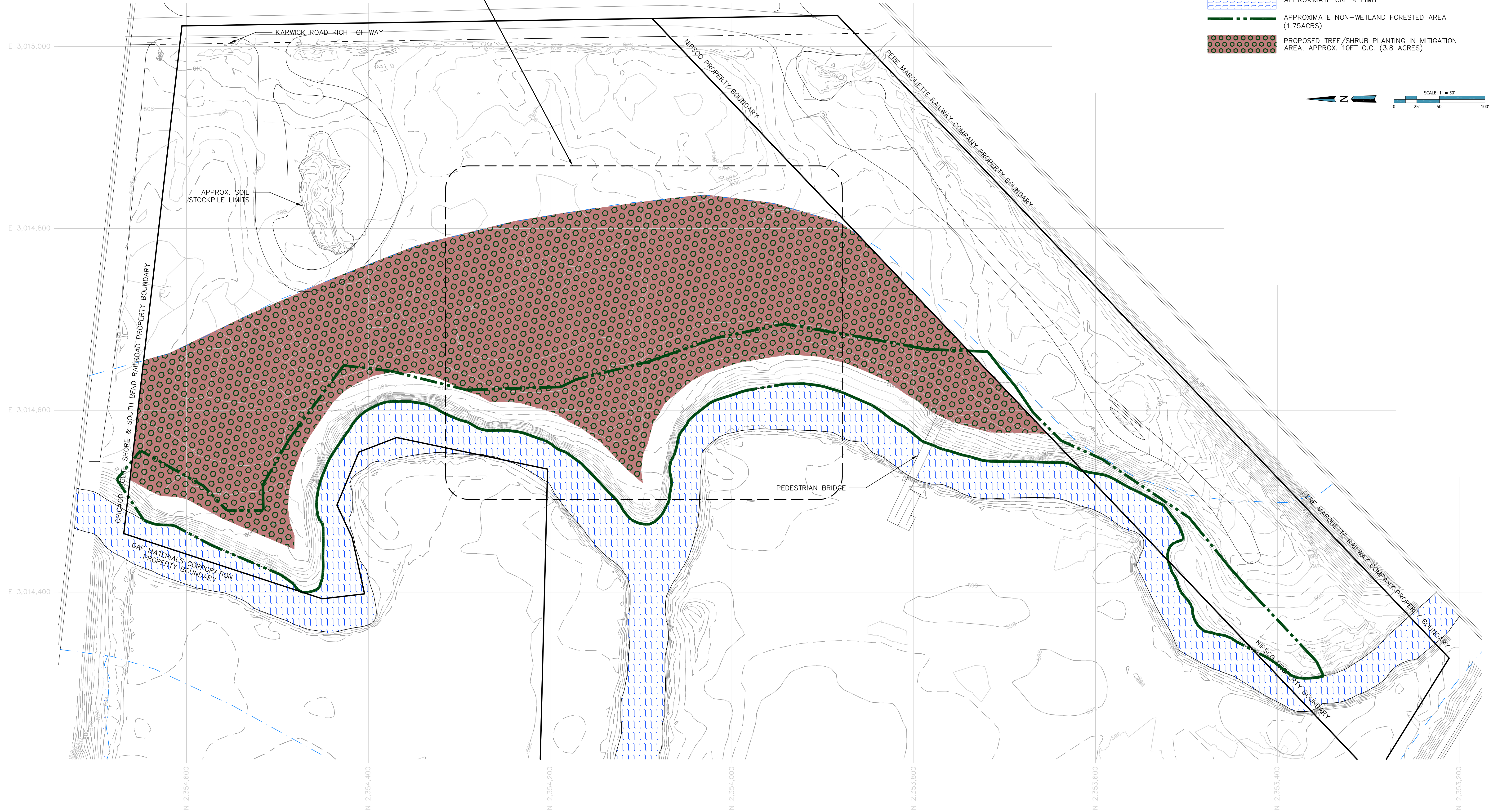
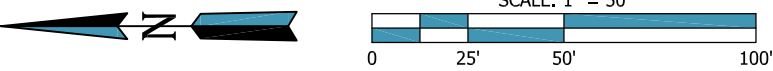
REFER TO LANDSCAPE DETAIL, SHEET 15

NOTES:

1. EXISTING TOPOGRAPHIC DATA OBTAINED FROM PHOTOGRAMETRIC METHODS OBTAINED DURING FLIGHT ON APRIL 26, 2017. ALTA/NSPS LAND TITLE SURVEY & TOPOGRAPHIC SURVEY PERFORMED BY WEAVER CONSULTANTS GROUP. DATE OF DRAWING 05/26/2017.
2. FLOOD ZONE APPROXIMATED FROM FEMA FLOOD INSURANCE RATE MAP #18091C0128D, EFFECTIVE DATE 11/06/2013.
3. SEE SHEET 16 FOR PLANTING NOTES AND DETAILS.
4. PLANTINGS SHALL BE PLACED NO CLOSER THAN 60 FEET TO THE NIPSCO PROPERTY LINE.

LEGEND

- 610 EXISTING 10' CONTOUR
- 604 EXISTING 2' CONTOUR
- PROPERTY BOUNDARY
- RIGHT OF WAY
- EXISTING GRAVEL ROAD
- FEMA ZONE "AE" FLOODWAY LIMIT
- FEMA ZONE "AE" FLOODPLAIN LIMIT
- FEMA ZONE "X" FLOODPLAIN LIMIT
- EXISTING RAILROAD
- APPROXIMATE CREEK LIMIT
- APPROXIMATE NON-WETLAND FORESTED AREA (1.75ACRS)
- PROPOSED TREE/SHRUB PLANTING IN MITIGATION AREA, APPROX. 10FT O.C. (3.8 ACRES)



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PROPOSED LANDSCAPING & PLANTING - 1  
CORRECTIVE ACTION  
KARWICK NATURE PARK  
MICHIGAN CITY, INDIANA

REVISION DESCRIPTION	DATE	No.



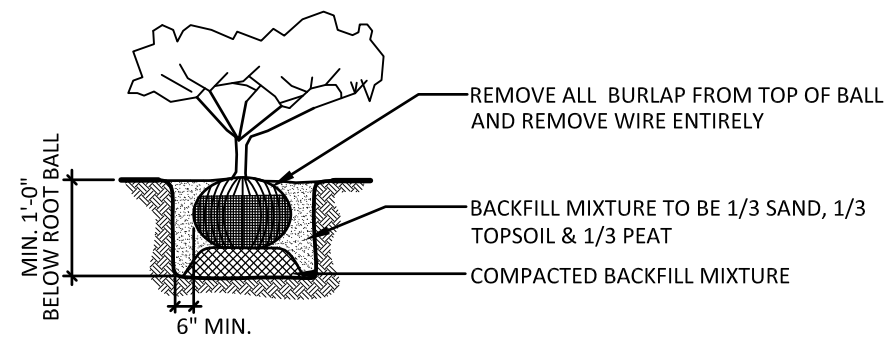
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FILE: 1873-356-DWG  
CAD: KNP0032.dwg

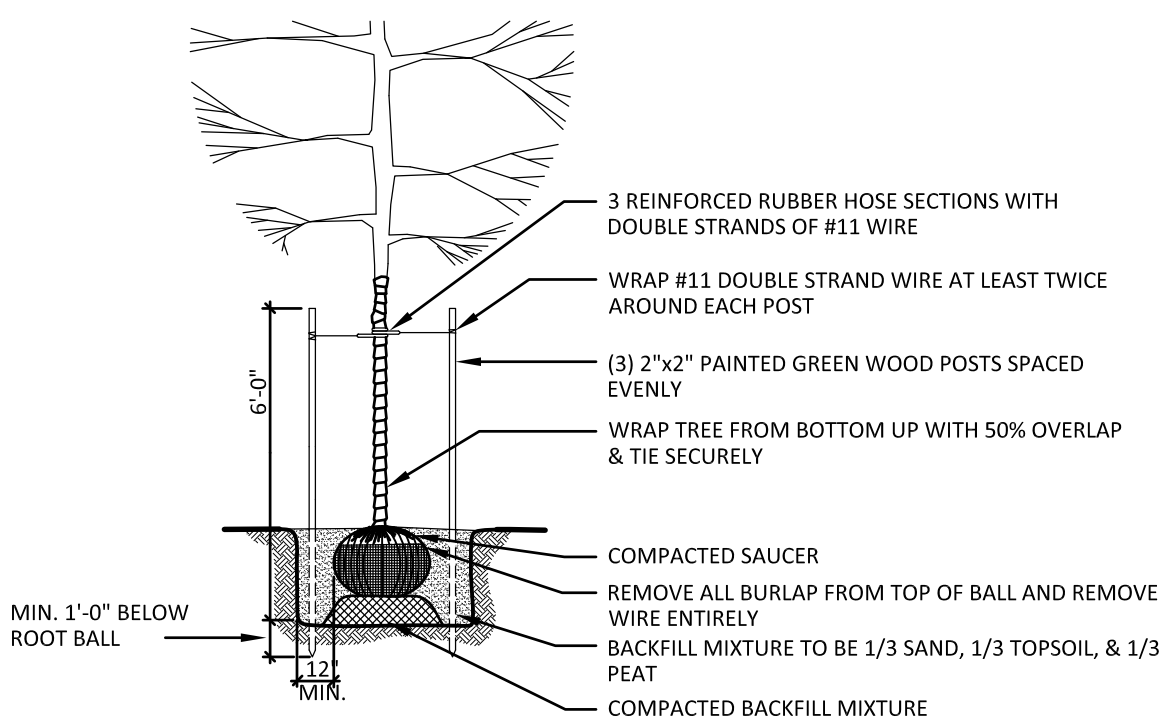
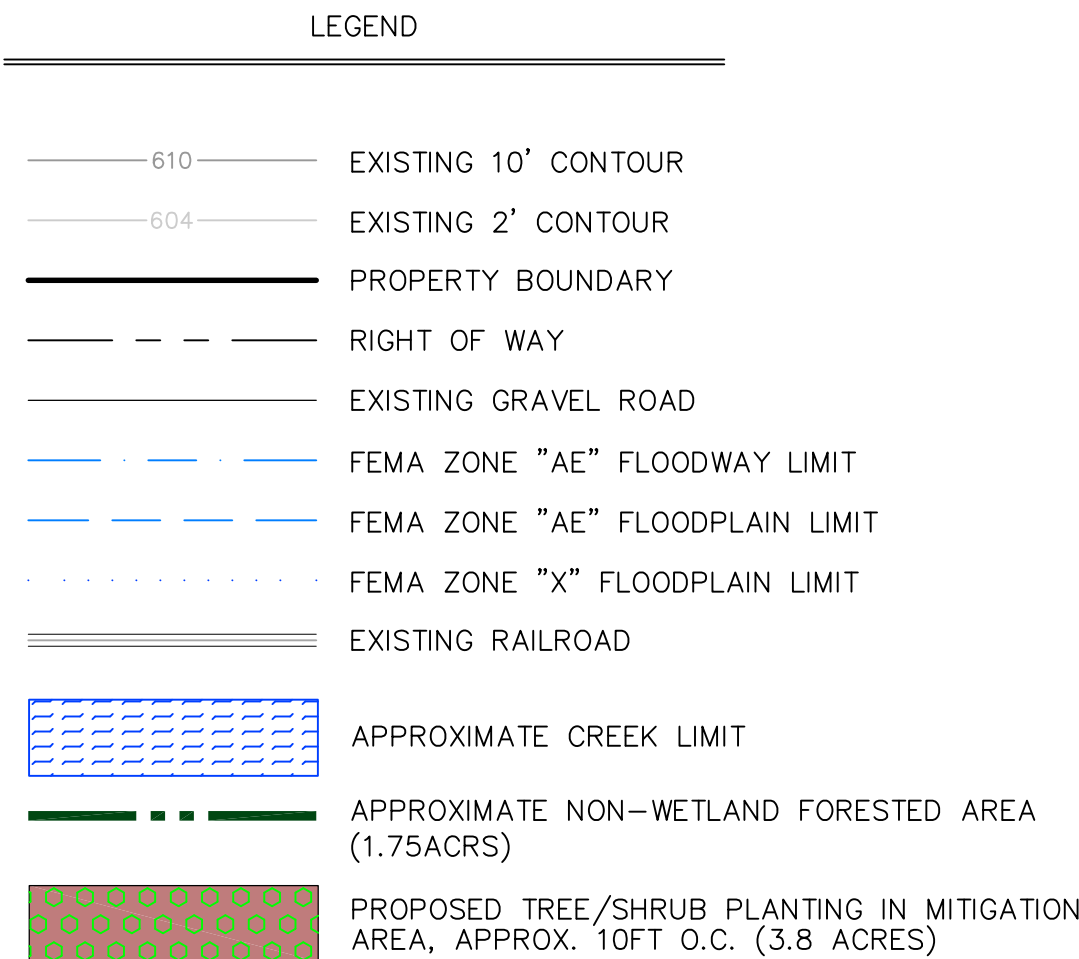




SHRUB INSTALLATION  
NOT TO SCALE

NOTES:

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- SEE SHEET 16 FOR PLANTING NOTES AND DETAILS.
- PLANTINGS SHALL BE PLACED NO CLOSER THAN 60 FEET TO THE NIPSCO PROPERTY LINE.



DECIDUOUS TREE INSTALLATION  
NOT TO SCALE

GENERAL LANDSCAPE NOTES

ALL CONSTRUCTION TO CONFORM TO THE LATEST APPLICABLE REGULATIONS.

THE CONTRACTOR SHOULD NOTE THAT MACHINE GRADING MODIFIED SHALL INCLUDE THE REMOVAL OF ALL BRUSH AND MISCELLANEOUS ITEMS AS REQUIRED. ALL REQUIRED EARTH EXCAVATION, EMBANKMENT AND ALL OTHER OPERATIONS NECESSARY TO DEVELOP THE DESIRED CROSS SECTION. ALL TOPSOIL REMOVED MAY BE STOCKPILED AND REUSED AS TOPSOIL SURFACE, A MIN. OF 6" DEEP. IF ADEQUATE ON-SITE TOP SOIL IS NOT AVAILABLE TO PROVIDE A MINIMUM 6" DEPTH THE CONTRACTOR SHALL BE RESPONSIBLE TO PROVIDE SCREENED TOP SOIL AS REQUIRED.

CONTRACTOR SHALL GRADE (OR REGRADE) ALL AREAS THAT ARE WITHIN THE MITIGATION AREA, AND PROVIDE CLASS A SEEDING - 200#/ACRE, MULCH - 2T/ACRE, AND CHEMICAL FERTILIZER NUTRIENT 240#/ACRE IN ACCORDANCE TO THE INDIANA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS WITH A 6" TOPSOIL BASE. AFTER THE TOPSOIL SURFACE IS INSTALLED, IT SHALL BE RAKED TO FORM A SMOOTH LAWN SURFACE, AND ALL STONES LARGER THAN 1/2" DIA. SHALL BE REMOVED. FERTILIZE AND WATER UNTIL GRASS TAKES HOLD. SEED, MULCH, AND FERTILIZER SHALL BE APPLIED THRU HYDROMULCHING. EXCEPT IN DEEP SLOPE AREAS THAT ARE TO RECEIVE MULCH BLANKET.

THE WATERING OF ALL LANDSCAPE MATERIAL SHALL BE ENTIRELY THE CONTRACTOR'S RESPONSIBILITY AND SHALL INCLUDE AS A MINIMUM, ONE COMPLETE IRRIGATION APPLICATION EVERY TWO (2) DAYS FOR A TOTAL OF SIX (6) APPLICATIONS. THEREAFTER, IRRIGATION SHALL BE PERFORMED BY THE CONTRACTOR ON AN AS-NEEDED BASIS, CONTINUED UNTIL THE DAY OF THE STORE'S GRAND OPENING TO THE GENERAL PUBLIC. THE CONTRACTOR SHALL BE RESPONSIBLE TO OBTAIN IRRIGATION WATER OFF SITE, AND TRANSPORT SUCH WATER VIA TANKER TRUCKS TO THE SITE.

LANDSCAPING GUARANTEE AND MAINTENANCE SPECIFICATIONS ARE AS FOLLOWS: THE CONTRACTOR SHALL PROVIDE THE CLIENT WITH A BONDED WRITTEN TWO-YEAR MAINTENANCE AND WARRANTY AGREEMENT. THIS AGREEMENT SHALL BE UNCONDITIONAL, AND INCLUDE LABOR AND MATERIALS, AND THE MAINTENANCE AND REPLACEMENT OF DEAD OR DYING PLANT MATERIAL, WATERING, FERTILIZING, AND TRIMMING (EXCLUDING THE CUTTING OF GRASS AREAS). THE CONTRACTOR SHALL PROVIDE THE CLIENT WITH A TYPEWRITTEN LIST OF SPECIFIC MAINTENANCE INSTRUCTIONS FOR EACH TYPE OF VEGETATION AND PLANT WITH THE WRITTEN AGREEMENT AND BOND.

PLANTING SCHEDULE						
MARK	NO.	BOTANICAL NAME	COMMON NAME	SIZE	ROOT	NOTES
SHRUBS/UNDERSTORY TREES	a	CERCUS CANADENSIS	REDBUD	2"φ - 3"φ	B & B	PLANTED 10' ON CENTER
	b	ROSA CAROLINA	CAROLINA ROSE	6"φ - 24"φ	B & B	PLANTED 10' ON CENTER
	c	HAMAMELIS VIRGINIANA	WITCH HAZEL	6"φ - 24"φ	B & B	PLANTED 10' ON CENTER
	d	LINDERA BENZOIN	NORTHERN SPICEBUSH	6"φ - 24"φ	B & B	PLANTED 10' ON CENTER
	d	SAMBUCUS CANADENSIS	ELDERBERRY	6"φ - 24"φ	B & B	PLANTED 10' ON CENTER
	d	CORNUS OBLIQUA	SILKY DOGWOOD	6"φ - 24"φ	B & B	PLANTED 10' ON CENTER
	d	CORNUS RACEMOSA	GRAY DOGWOOD	6"φ - 24"φ	B & B	PLANTED 10' ON CENTER
	e	ASIMINA TRILOBA	COMMON PAW PAW	2"φ - 3"φ	B & B	PLANTED 10' ON CENTER
	A	QUERCUS ALBA	WHITE OAK	3"φ - 4"φ	B & B	PLANTED 10' ON CENTER
	B	CARYA CORDIFORMIS	BITTERNUT HICKORY	3"φ - 4"φ	B & B	PLANTED 10' ON CENTER
CANOPY TREES	C	QUERCUS RUBRA	NORTHERN RED OAK	3"φ - 4"φ	B & B	PLANTED 10' ON CENTER
	D	CARYA LACINIOSA	SHELLBARK HICKORY	3"φ - 4"φ	B & B	PLANTED 10' ON CENTER
	D	PLATANUS OCCIDENTALIS	AMERICAN SYCAMORE	3"φ - 4"φ	B & B	PLANTED 10' ON CENTER
	D	QUERCUS BICOLOR	SWAMP WHITE OAK	3"φ - 4"φ	B & B	PLANTED 10' ON CENTER
	D	QUERCUS PALUSTRIS	PIN OAK	3"φ - 4"φ	B & B	PLANTED 10' ON CENTER
	E	ACER RUBRUM	RED MAPLE	3"φ - 4"φ	B & B	PLANTED 10' ON CENTER

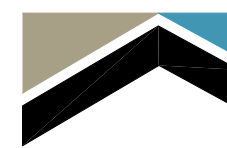
DRAFT  
☒ RELEASED FOR BID  
☐ APPROVED FOR CONSTRUCTION  
☐ CLIENT APPROVAL BY:



PROPOSED LANDSCAPING & PLANTING - 2  
CORRECTIVE ACTION  
KARWICK NATURE PARK  
MICHIGAN CITY, INDIANA

REVISION DESCRIPTION	DATE	NO.

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REVIEWED BY: BED  
DATE: 03/01/2019  
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CAD: KNP0032.dwg



GENERAL NOTES:

- ALL TREE CLEARING SHALL BE PERFORMED BEFORE MARCH 31ST.
- CLEARED TREES SHALL BE CHIPPED ON SITE AND DISPOSED OF OFF SITE.
- SILT FENCE SHALL BE INSTALLED AROUND PERIMETER OF PROJECT AREA PRIOR TO STARTING EXCAVATION.
- FILL AREAS TO BE CLEARED OF TREES/BRUSH PRIOR TO PLACING WASTE.
- ALL DISTURBED AREAS SHALL BE SEEDED, FERTILIZED, AND MULCHED. CONTRACTOR WILL BE RESPONSIBLE FOR ESTABLISHING VEGETATION. HYDROSEEDING MAY BE USED ON BANK STABILIZATION AREAS.
- THE CONTRACTOR SHALL COLLECT AND REMOVE ALL CONSTRUCTION DEBRIS, EXCESS MATERIALS, TRASH, OIL AND GREASE RESIDUE, MACHINERY, TOOLS, AND OTHER MISCELLANEOUS ITEMS WHICH WERE NOT PRESENT PRIOR TO PROJECT COMMENCEMENT, AT NO ADDITIONAL EXPENSE TO THE OWNER. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ACQUIRING ANY AND ALL PERMITS NECESSARY FOR THE HAULING AND DISPOSAL REQUIRED FOR CLEAN-UP AS DIRECTED BY THE ENGINEER OR OWNER. BURNING ON THE SITE IS NOT PERMITTED.
- ALL EXISTING UTILITIES OR IMPROVEMENTS INCLUDING WALKS, CURBS, PAVEMENT, AND PARKWAYS DAMAGED OR REMOVED DURING CONSTRUCTION SHALL BE PROMPTLY RESTORED TO THEIR RESPECTIVE ORIGINAL CONDITION.
- THE ENGINEER AND OWNER ARE NOT RESPONSIBLE FOR THE CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES OR PROCEDURES, TIME OF PERFORMANCE, PROGRAMS OR FOR ANY SAFETY PRECAUTIONS USED BY THE CONTRACTOR. THE CONTRACTOR IS SOLEY RESPONSIBLE FOR EXECUTION OF HIS WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS AND SPECIFICATIONS.
- ELECTRIC, TELEPHONE, NATURAL GAS, AND OTHER UTILITY COMPANIES HAVE UNDERGROUND AND/OR OVERHEAD SERVICE FACILITIES IN THE VICINITY OF THE PROPOSED WORK. THE CONTRACTOR SHALL BE RESPONSIBLE FOR HAVING THE UTILITY COMPANIES LOCATE THEIR FACILITIES IN THE FIELD PRIOR TO CONSTRUCTION AND SHALL ALSO BE RESPONSIBLE FOR THE MAINTENANCE AND PRESERVATION OF THESE FACILITIES.
- THE CONTRACTOR SHALL COMPLY WITH ALL STATE AND FEDERAL SAFETY REGULATIONS AS OUTLINED IN THE LATEST REVISIONS OF THE FEDERAL CONSTRUCTION SAFETY STANDARDS (SERIES 1926) AND WITH APPLICABLE PROVISIONS AND REGULATIONS OF THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) STANDARDS OF THE WILLIAMS STELGER OCCUPATIONAL HEALTH STATE SAFETY ACT OF 1970 (REVISED). THE CONTRACTOR, ENGINEER AND OWNER SHALL EACH BE RESPONSIBLE FOR HIS OWN RESPECTIVE AGENTS AND EMPLOYEES.
- THE GRADING AND CONSTRUCTION OF THE SITE IMPROVEMENTS SHALL NOT CAUSE PONDING OF STORM WATER. ALL AREAS ADJACENT TO THESE IMPROVEMENTS SHALL BE GRADED TO ALLOW POSITIVE DRAINAGE.
- WATER THAT HAS CONTACTED EXPOSED WASTE MAY NOT BE PUMPED OR DIRECTED INTO THE CREEK OR KARWICK ROAD DITCH. CONTACT WATER (LEACHATE) MUST BE HAULED OR PUMPED OFF-SITE TO THE SANITARY DISTRICT.
- RECORD DRAWINGS SHALL BE FURNISHED BY THE ENGINEER.

CREEK BANK NOTES:

- CONTRACTOR SHALL FOLLOW ALL APPLICABLE OSHA SAFETY STANDARDS DURING BANK EXCAVATION AND SEEP DRAIN INSTALLATION.
- SOIL AND WASTE EXCAVATED FROM THE BANK WILL BE DEPOSITED WITHIN THE PROPOSED EXCAVATED WASTE FILL AREA. CLEAN SOIL EXCAVATED FROM THE BANK SHALL BE SEGREGATED FROM THE WASTE AND MAY BE USED AS SOIL FILL IN THE UPLAND AREAS AS NECESSARY TO ACHIEVE 2' COVER OVER EXISTING WASTE IF APPROVED BY THE OWNER & ENGINEER.
- MONITORING WELLS MW-2S, 2D, 4S, 4D, 5S, 6S, 6D WILL BE ABANDONED AND REPLACED AFTER CONSTRUCTION BY OTHERS. CONTRACTOR WILL NEED TO COORDINATE ABANDONMENT AND REPLACEMENT WITH MONITORING WELL CONTRACTOR.
- CONTRACTOR MAY LEAVE AN AREA UNEXCAVATED TEMPORARILY AT THE TRAIL CREEK WATER LINE OR UTILIZE SHEETING OR OTHER MEANS TO FACILITATE INSTALLATION OF THE LEACHATE SEEP DRAIN TRENCH.
- LEACHATE SEEP DRAIN EXCAVATION BENCH ELEVATION MAY BE MODIFIED BASED ON WATER LEVEL AT TIME OF CONSTRUCTION.
- THE USE OF CRANE MATS OR SIMILAR MAY BE NECESSARY ON SEEP DRAIN EXCAVATION BENCH TO FACILITATE TRUCK TRAFFIC.
- THE PROPOSED 18" STORM WATER PIPE SHALL TERMINATE IN A FLARED END SECTION AND SHALL EMPTY ONTO A 10'x10' (D<sub>50</sub>=12") APRON UNDERLAIN BY 8 OZ/SY NONWOVEN GEOTEXTILE.
- ALL EXPOSED WASTE ON THE CREEK BANK OR THE WASTE FILL AREA SHALL BE COVERED WITH CLEAN SOIL, TARPS, OR SPRAY-ON COVER (POSI-SHELL OR SIMILAR) AT THE END OF EACH DAY. IF TARPS ARE USED, THEY MUST BE SUFFICIENTLY SECURED SO THEY DO NOT BLOW AWAY.

UPLAND PARK NOTES:

- WASTE PLACED IN EXCAVATED WASTE PILE AREA SHALL BE PLACED IN 2' LIFTS AND TRACKED IN PLACE TO COMPACT THE WASTE TO THE EXTENT POSSIBLE.
- CONTRACTOR SHALL NOT PLACE WASTE ON NIPSCO PROPERTY AND SHALL MINIMIZE DISTURBANCE TO NIPSCO PROPERTY.
- EXCAVATED WASTE PILE SHALL HAVE 18" CLEAN SOIL FILL AND 6" TOPSOIL PLACED UPON COMPLETION OF EXCAVATION ACTIVITIES.
- CONTRACTOR SHALL MAINTAIN REQUIRED OSHA SETBACKS FROM EXISTING POWER LINES.
- EXISTING FENCING ON NIPSCO PROPERTY SHALL BE MAINTAINED.

RIGHT OF WAY NOTES:

- CONTRACTOR SHALL OBTAIN APPROVALS TO WORK IN RIGHT-OF-WAY PRIOR TO WORKING IN RIGHT-OF-WAY.
- CONTRACTOR SHALL USE PROPER SIGNAGE IN ACCORDANCE WITH MICHIGAN CITY TRAFFIC ORDINANCES WHEN CLOSING THE ROAD TO INSTALL STORM SEWER OR FORCEMAIN PIPING.
- CONTRACTOR SHALL CLEAN KARWICK ROAD USING A STREET SWEEPER OR OTHER APPROVED METHOD ONCE PER DAY AND AS NECESSARY TO MAINTAIN CLEAN AND DUST-FREE DRIVING CONDITIONS.
- CONTRACTOR SHALL PROVIDE FLAGMEN AND SIGNAGE AT THE CONSTRUCTION ENTRANCE AND EXIT POINTS AS NECESSARY TO COMPLY WITH MICHIGAN CITY REGULATIONS.
- CONTRACTOR SHALL HYDROEXCAVATE AND EXPOSE EXISTING UTILITIES AND PROVIDE UTILITY ELEVATIONS TO ENGINEER TO FINALIZE PROPOSED STORM SEWER PIPE ELEVATIONS.
- ALL FORCEMAIN INSTALLED WITHIN KARWICK ROAD SHALL BE DIRECTIONALLY DRILLED TO THE EXTENT POSSIBLE TO MINIMIZE KARWICK ROAD CLOSURES.

UNDERGROUND NOTES:

- WORK UNDER THIS SECTION SHALL INCLUDE TRENCHING, INSTALLATION OF PIPE, CASTINGS, STRUCTURES, BACKFILLING OF TRENCHES AND COMPACTION, AND TESTING AS SHOWN ON THE CONSTRUCTION PLANS. FITTINGS AND ACCESSORIES NECESSARY TO COMPLETE THE WORK MAY NOT BE SPECIFIED, BUT SHALL BE CONSIDERED AS INCIDENTAL TO THE COST OF THE CONTRACT.
- ALL UTILITY AND SERVICE TRENCHES UNDER OR WITHIN TWO FEET OF PAVED SURFACES OR DRIVING AREAS SHALL BE BACKFILLED WITH INDOT #53 STONE AND PROPERLY COMPACTED. MECHANICALLY COMPACTED BACKFILL SHALL BE PLACED IN SIX-INCH HORIZONTAL LAYERS OF THICKNESS. EACH LAYER SHALL BE EVENLY SPREAD, MOISTENED (OR DRIED, IF NECESSARY), AND THEN TAMPED OR ROLLED UNTIL 90 PERCENT RELATIVE COMPACTION IS ACHIEVED.
- STORM SEWER MANHOLES SHALL BE PRECAST STRUCTURES, WITH THE DIAMETER DEPENDENT ON THE PIPE SIZE, AND WITH APPROPRIATE FRAME AND LIDS (REFER TO DETAILS).
- ALL STORM SEWERS SHALL HAVE COMPACTED INDOT #53 STONE GRANULAR BEDDING A MINIMUM OF 4" BELOW THE BOTTOM OF THE PIPE FOR THE FULL LENGTH. BEDDING SHALL EXTEND TO THE SPRING LINE OF THE PIPE. COST FOR THE BEDDING SHALL BE MERGED WITH THE UNIT PRICE BID FOR THE PIPE.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR DEWATERING ANY EXCAVATION FOR THE INSTALLATION OF THE SEWER OR WATER SYSTEMS. ANY DEWATERING ENCOUNTERED SHALL BE INCIDENTAL TO THE RESPECTIVE UNDERGROUND UTILITY.
- ALL STRUCTURES SHALL HAVE A MAXIMUM OF 12" OF ADJUSTING RINGS, UNLESS OTHERWISE NOTED.
- ALL TOP FRAMES FOR STORM SEWER AND FORCEMAIN COVERS ARE TO BE ADJUSTED TO MEET FINAL FINISH GRADE UPON COMPLETION OF FINISHED GRADING AND FINAL INSPECTIONS. THIS ADJUSTMENT IS TO BE MADE BY THE UNDERGROUND CONTRACTOR AND THE COST IS TO BE INCIDENTAL. THE UNDERGROUND CONTRACTOR SHALL INSURE THAT ALL ROAD AND PAVEMENT INLETS OR STRUCTURES ARE AT FINISHED GRADE. ANY ADJUSTMENTS NECESSITATED BY THE CURB OR PAVING CONTRACTOR TO ACHIEVE FINAL RIM GRADE, RESULTING IN AN EXTRA FOR SAID ADJUSTMENTS, WILL BE CHARGED TO THE UNDERGROUND CONTRACTOR.
- ALL CATCH BASINS AND SUMPS ARE TO BE CLEANED AT THE END OF THE PROJECT PRIOR TO FINAL ACCEPTANCE. CLEANING MAY ALSO BE REQUIRED DURING THE COURSE OF THE CONSTRUCTION OF THE PROJECT IF IT IS DETERMINED THAT THE SILT AND DEBRIS TRAPS ARE NOT FUNCTIONING PROPERLY.
- IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO REMOVE FROM THE SITE ANY AND ALL MATERIALS AND DEBRIS WHICH RESULT FROM HIS CONSTRUCTION OPERATIONS AT NO ADDITIONAL EXPENSE TO THE OWNER.
- CONTRACTOR SHALL NOT EXPOSE EXISTING GAS LINES WITHOUT NIPSCO GM&T PERSONNEL ON-SITE.

MICHIGAN CITY STANDARD LIFT STATION NOTES:

- THE ELECTRIC SERVICE AND ELECTRICAL CONTROLS FOR THE LIFT STATION SHALL BE PROVIDED BY THE CONTRACTOR. ALL COORDINATION WITH THESE UTILITY COMPANIES AND THE COST OF THEIR FEES, PERMITS AND INSTALLATION WORK SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
- ALL ELECTRICAL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE (NEC), ALL LOCAL ELECTRIC CODES AND THE REQUIREMENTS OF THE ELECTRICAL UTILITY, NIPSCO.
- THE LOCATION OF ALL BURIED ELECTRICAL CONDUIT SHALL BE MARKED WITH CONTINUOUS PLASTIC TAPE, A MINIMUM OF 6 INCHES WIDE AND 4 MILS THICK AND BURIED DIRECTLY ABOVE THE CONDUIT, APPROXIMATELY 8 INCHES BELOW FINISHED GRADE.
- THE LIFT STATION CONTRACTOR SHALL MEET ON-SITE WITH MICHIGAN CITY SANITARY DISTRICT (MCSO) OFFICIALS AND THE ENGINEER AT THE FOLLOWING LIFT STATION CONSTRUCTION STAGES: (1) PRIOR TO BEGINNING, (2) AT 50% COMPLETION, (3) AT SUBSTANTIAL COMPLETION START-UP AND (4) AT 100% COMPLETION OF THE LIFT STATION. PRIOR TO SCHEDULING THE SUBSTANTIAL COMPLETION START-UP WITH MCSO OFFICIALS, THE CONTRACTOR SHALL FULLY START-UP ALL LIFT STATION EQUIPMENT. MCSO OFFICIALS WILL ISSUE A LETTER OF ACCEPTANCE AT 100% COMPLETION UPON COMPLIANCE WITH ANY "PUNCH LIST" OF ITEMS TO BE COMPLETED, WHICH WAS GENERATED AT THE SUBSTANTIAL COMPLETION START-UP OF ALL LIFT STATION EQUIPMENT, OR THEREAFTER.
- THE CONTRACTOR SHALL FURNISH THE MCSO WITH ONE (1) DIGITAL AND FOUR (4) HARD COPIES OF THE FOLLOWING DOCUMENTS:
  - LIFT STATION OPERATION AND MAINTENANCE MANUAL, WITH COMPLETE DETAILED INFORMATION ON ALL LIFT STATION EQUIPMENT AND COMPONENTS AND A FIRST PAGE SUMMARY SHEET OR INDEX WHICH CLEARLY INDICATES THE CONTENTS OF THE MANUAL ALL REFERENCED AND MARKED BY NUMBERED TABS;
  - AS-BUILT CONSTRUCTION DRAWINGS OF THE LIFT STATION, INCLUDING A SITE PLAN, WITH STATE PLANE COORDINATES AND NGVD88 ELEVATION DATA FOR RIMS AND INVERTS OF WET WELL, OTHER MANHOLES, AND CONNECTING SEWERS;
  - LIFT STATION START-UP PROCEDURE AND RESULTS CHECK LIST; AND PARTS LIST.
- THE FOLLOWING LIFT STATION EQUIPMENT SHALL BE PROVIDED:
  - SUBMERSIBLE PUMPS, MINIMUM 3 HP (2.7 HP) AND COMPLETE PUMP CONTROLS BY ABS PUMPS, INC. OR APPROVED EQUAL.
  - ELECTRICAL POWER FOR THE LIFT STATION SHALL BE 240/480 VOLT, 3-PHASE, DEPENDING ON THE AVAILABLE POWER SUPPLY AND THE REQUIREMENTS OF THE LIFT STATION EQUIPMENT. IF AN ELECTRICAL PHASE CONVERTER IS REQUIRED FOR 3 PHASE ELECTRICAL POWER SUPPLY, IT SHALL BE A STATIC TYPE BY RONK ELECTRICAL INDUSTRIES, OR APPROVED EQUAL, AND SHALL BE SIZED FOR THE PROPER HP RATING.
  - THE PORTABLE GENERATOR RECEPTACLE, IF REQUIRED, SHALL HAVE AN A/B SWITCH OR KNIFE SWITCH, WHICH SHALL BE MOUNTED ON THE BOTTOM RIGHT-HAND CORNER OF THE SWITCH ENCLOSURE, FACING DOWNWARD, MATCHING THE AVAILABLE POWER SUPPLY AND SHALL BE ONE OF THE FOLLOWING:
    - HUBBELL 560B9W FOR 240 VOLT, 3-PHASE FOR KW/KVA LESS THAN 65/81
    - HUBBELL 460B7W FOR 480 VOLT, 3-PHASE FOR KW/KVA LESS THAN 65/81
    - APPLETON AR20044 FOR 480 VOLT, 3-PHASE FOR KW/KVA GREATER THAN 288
  - PERMANENT STAINLESS STEEL CHAINS FOR THE INSTALLATION AND REMOVAL OF EACH PUMP ON ITS GUIDE RAIL SYSTEM. EACH CHAIN SHALL HAVE SUFFICIENT STRENGTH AND LENGTH TO REACH FROM EACH PUMP TO AT LEAST FOUR (4) FEET ABOVE THE TOP OF THE LIFT STATION WET WELL. EACH CHAIN SHALL BE SECURED ON A STAINLESS STEEL HOOK BOLT, ANCHORED TO THE TOP SLAB OF THE WET WELL, IN THE PUMP ACCESS OPENING.
  - THE PUMP LEVEL CONTROL AND CONTROL TRANSMISSION SYSTEM SHALL INCLUDE A PRESSURE TRANSDUCER IN THE WET WELL, AN AMETEK MODEL 575, COMPLETE WITH 50 FEET OF CABLE TO EXTEND TO THE ELECTRONIC UNIT WITHOUT SPLICING. THE ELECTRONIC UNIT SHALL BE LOCATED IN THE STATION CONTROL PANEL.
  - THE PRECEDING ELECTRONIC UNIT IN ITEM 6(F) SHALL INCLUDE ONE 24"x24"x8" NEMA 4X FIBERGLASS ENCLOSURE, PROVIDED COMPLETE WITH A SWING-OUT FRONT PANEL. THE SWING-OUT FRONT PANEL SHALL INCLUDE AN SJE RHOMBUS SP6R-LSC LEVEL CONTROLLER WHICH SHALL BE PROGRAMMABLE TO START-STOP THE PUMPS AT THE WET WELL LEVELS INDICATED ON THE DRAWINGS. A DIGITAL DISPLAY SHALL BE INCLUDED TO DISPLAY THE WET WELL LEVELS.
  - THE REAR OF THE ELECTRONIC UNIT ENCLOSURE SHALL INCLUDE A MISSION M800 REAL TIME RTU, PROVIDED BY B.L. ANDERSON CO., TELEPHONE NUMBER 765-463-1518, AND WITH CARD ADDITION CAPABILITY FOR EIGHT (8) DIGITAL INPUTS (DI) AND TWO (2) ANALOG INPUTS (AI). THE MISSION M800 SHALL TRANSMIT THE FOLLOWING SIGNALS TO THE SANITARY DISTRICT OF MICHIGAN CITY:
    - AI-1 WET WELL LEVEL
    - DI-1 PUMP 1 RUN/OFF
    - DI-2 PUMP 2 RUN/OFF
    - DI-3 PUMP 1 FAIL/NORMAL
    - DI-4 PUMP 2 FAIL/NORMAL
    - DI-5 LOW WET WELL LEVEL/NORMAL
    - DI-6 HIGH WET WELL LEVEL/NORMAL
    - DI-7 POWER FAIL
    - DI-8 FLOAT CONTROL
  - ALSO INCLUDED IN THE 24"x24"x8" ELECTRONIC UNIT ENCLOSURE SHALL BE A UPS, POWER FAIL RELAY, 24 VDC POWER SUPPLY, LIGHTNING ARRESTOR, CONDENSATION HEATER WITH THERMOSTAT, TERMINAL BLOCKS, CIRCUIT BREAKER, RECEPTACLE, AND GFI. ALL ALARMS SHALL BE AUTOMATICALLY SELF-CORRECTING (ALARM CONDITION IS REMOVED WHEN EVENT THAT TRIGGERS ALARM IS CORRECTED). PUMP FAILURE SHALL BE MONITORED THROUGH THE MOTOR STARTERS WITH ISOLATED CONTACTS. THE M800 AND PRESSURE TRANSDUCER SHALL BE PROVIDED WITH BATTERY BACK-UP TO SEND WATER LEVEL DATA TO THE PLANT IN THE EVENT OF A POWER FAILURE I. PROVIDE TWO (2) MERCURY-FREE FLOAT SWITCHES, EACH WITH 50 FT. OF CABLE TO EXTEND TO THE ELECTRONIC UNIT WITH NO SPLICING OF CABLES ALLOWED. THE FLOATS SHALL BE UTILIZED TO START AND STOP THE "LEAD" AND "LAG" PUMPS IN THE EVENT OF A FAILURE OF THE LEVEL TRANSMITTER OR CONTROLLER AND TO ALARM THE FAILURE AT THE ELEVATIONS INDICATED ON THE DRAWINGS. THE PUMP CONTROLS SHALL PREVENT THE SIMULTANEOUS START OF BOTH PUMPS UNDER THIS SITUATION.
  - THE PUMP LEVEL CONTROL FLOATS SHALL HAVE SUFFICIENT WEIGHT TO HANG FREELY, WITHOUT INTERMEDIATE SUPPORT, FROM STAINLESS STEEL SUPPORTS THAT ARE SECURED TO THE WET WELL WALL, JUST BELOW THE TOP SLAB OF THE WET WELL. THE TRANSDUCER SHALL BE ATTACHED TO A 1/8"316 STAINLESS STEEL CABLE AND 316 STAINLESS STEEL CLAMPS. A WEIGHT SHALL BE ATTACHED AT THE BOTTOM OF CABLE AND TRANSDUCER AND SHALL BE ATTACHED JUST ABOVE THE WEIGHT NEAR THE BOTTOM OF THE WET WELL.

MICHIGAN CITY STANDARD LIFT STATION NOTES (CONTINUED):

- SUPPLIER(S) OF THE PUMP STATION CONTROL SYSTEM SHALL PROVIDE ONE DAY OF SUPERVISORY STARTUP SERVICE TO INSURE PROPER OPERATION OF THE SYSTEM.
- THE PUMP CONTROLS SHALL BE PROVIDED BY THE PUMP MANUFACTURER AND SHALL INCLUDE THE FOLLOWING:
  - A NEMA 3R STAINLESS STEEL ENCLOSURE WITH OUTSIDE SOLID DOOR AND AN INSIDE DOOR WITH INSTRUMENTATION MOUNTING. THE CONTROL PANEL SHALL BE DESIGNED TO CONVENIENTLY HOLD THE OUTSIDE DOOR IN A 180 DEGREE FULLY OPEN POSITION AND THE INSIDE INSTRUMENT DOOR IN A 120 DEGREE OPEN POSITION.
  - THE FOLLOWING STARTING AND OVERLOAD PROTECTION FACILITIES FOR EACH PUMP:
    - A COMBINATION NEMA RATED MOTOR STARTER AND CIRCUIT PROTECTOR TO PROVIDE SHORT CIRCUIT PROTECTION PER NEC CODE.
    - A MANUAL RESET FOR DUAL PROTECTION AGAINST CURRENT OVERLOADS AND SHORT CIRCUITS.
    - AN OVERLOAD RELAY TO BE PRE-CALIBRATED TO MATCH MOTOR CHARACTERISTICS.
    - A HAND/OFF/AUTO SELECTOR SWITCH MOUNTED ON THE INSIDE DOOR OF THE CONTROL ENCLOSURE.
  - THERMAL OVERLOAD PROTECTION SHUTOFF SWITCHES, RESTART BUTTONS AND WARNING LIGHTS FOR EACH PUMP.
  - A 20 AMP 115 VOLT GFI RECEPTACLE IN THE PUMP CONTROL SYSTEM ENCLOSURE.
  - RUN AND MOISTURE SENSOR WARNING LIGHTS FOR EACH PUMP MOUNTED ON THE INSIDE DOOR OF THE CONTROL ENCLOSURE.
  - A SEPARATE CIRCUIT BREAKER FOR THE PUMP CONTROL SYSTEM.
  - LIGHTNING/SURGE PROTECTION FOR THE ENTIRE PUMP CONTROL SYSTEM.
  - A 100 WATT HEATER WITH THERMOSTAT AND OVER-TEMPERATURE CONTROL FOR MOISTURE CONTROL INSIDE THE PUMP CONTROL ENCLOSURE.
  - DRY CONTACTS FOR PUMP THERMAL FAILURE.
  - EITHER A 3-PHASE ELECTRICAL SUPPLY MONITOR OR A LOW ELECTRICAL VOLTAGE MONITOR, IF AN ELECTRICAL PHASE CONVERTER IS USED FOR LIFT STATION POWER SUPPLY. THIS MONITOR SHALL INTERRUPT POWER TO THE PUMP CONTROLS IN AN ELECTRICAL SUPPLY PROBLEM CONDITION. CIRCUIT BREAKERS SHALL BE PROVIDED IN THE PUMP CONTROL PANEL FOR THE FOLLOWING ACCESSORIES:
    - AREA LIGHT
    - GFI RECEPTACLE
    - 100 WATT HEATER
    - CONTROLS
- THE LIFT STATION ACCESSORIES SHALL BE PROVIDED, AS INDICATED ON THE DETAILS CONTAINED ON THE DRAWINGS AND/OR SPECIFIED BELOW AND AS REQUIRED:
  - THE ALUMINUM HATCHES FOR THE TOPS OF THE LIFT STATION WET WELL AND VALVE VAULT STRUCTURES SHALL BE SERIES SIS, AS MANUFACTURED BY HALLIDAY PRODUCTS OR APPROVED EQUAL. THE HATCHES SHALL BE THE SIZE INDICATED, OR LARGER IF REQUIRED, FOR THE EASY REMOVAL OF THE WET WELL PUMPS OR THE VALVE VAULT VALVES. EACH HATCH SHALL HAVE A RECESSED SLAM-LOCK AND 90 DEGREE OPEN HOLDING LATCH.
  - THE AREA LIGHT SHALL HAVE A 3000 KELVIN HID LED BASE (70W HPS EQUAL), VANDAL-PROOF ACRYLIC AND/OR CAST ALUMINUM HOUSING, AND INTEGRAL PLUG-IN PHOTOELECTRIC CELL FOR AUTOMATIC DUSK TO DAWN OPERATION.
  - ALL CABLES AND CONDUCTORS SHALL BE IN CONDUIT; SCHEDULE 80 PVC FOR BURIED AND RIGID GALVANIZED STEEL FOR EXPOSED. ALL CONDUIT SIZES SHALL BE OVERSIZED FOR EASY FUTURE REMOVAL OF THE CABLES AND CONDUCTORS AND THEIR REPLACEMENT WITH THE NEXT LARGER SIZE.
  - TWO VALVE OPERATING T-WRENCHES SHALL BE PROVIDED, ONE EIGHT (8) FEET LONG AND ONE THREE (3) FEET LONG, FOR OPENING THE PLUG VALVES IN THE VALVE VAULT FROM THE TOP OF THE VAULT.
- THE LIFT STATION PIPING, FITTINGS AND VALVES SHALL BE PROVIDED AS INDICATED ON THE DETAILS CONTAINED ON THE DRAWING AND/OR AS SPECIFIED BELOW.
  - THE SIZES OF THE PIPING, FITTINGS AND VALVES FOR THE SUBMERSIBLE PUMP DISCHARGE AND THE EMERGENCY PUMP SUCTION AND DISCHARGE CONNECTIONS SHALL BE SPECIFICALLY DETERMINED FOR THE PUMP STATION DESIGN CAPACITY.
  - ALL INTERIOR OR BURIED PIPING SHALL BE CLASS 50 DUCTILE IRON.
  - ALL INTERIOR OR BURIED FITTINGS SHALL BE CLASS 250 DUCTILE IRON WITH FLANGED JOINTS.
  - PUMP DISCHARGE CHECK VALVES SHALL BE SWING-CHECK TYPE WITH OUTSIDE WEIGHTED ARM AND MANUFACTURED IN ACCORDANCE WITH AWWA SPECIFICATION C508. THE CHECK VALVES SHALL BE DUCTILE IRON AND HAVE FLANGED ENDS AS PER ANSI B.16.1 CLASS 125. THE VALVES SHALL HAVE AN ACCESS FLANGE FOR INTERNAL VALVE MAINTENANCE, WITHOUT REMOVING THE VALVE FROM THE PIPELINE.
  - PUMP DISCHARGE PLUG VALVES SHALL HAVE ECCENTRIC ACTION SUCH THAT THE VALVE PLUG RISES OFF THE SEAT DURING OPERATION. THE VALVE PLUG SHALL BE NEOPRENE OF BUNA-N FACED. THE PLUG VALVES SHALL BE IRON OR SEMI-STEEL AND HAVE FLANGED ENDS AS PER ANSI B.16.1 CLASS 125. PLUG VALVE OPERATORS SHALL BE AS INDICATED IN THE DRAWING DETAILS. PLUG VALVES SHALL BE DEZURICK SERIES 100, OR EQUAL.
  - ALL PIPE CONNECTIONS TO FITTINGS AND VALVES CAN BE WITH FIELD FLANGES, UNI-FLANGE OR EQUAL.
  - PUMP DISCHARGE CHECK, PLUG, AND BYPASS VALVES SHALL BE LOCATED IN A SEPARATE STRUCTURE WITH ALUMINUM HATCH. THIS STRUCTURE SHALL HAVE A DRAIN THAT RETURNS TO THE WET WELL WITH AN APPROPRIATE TRAP, AS INDICATED ON THE DRAWING.



NOTES  
CORRECTIVE ACTION  
KARWICK NATURE PARK  
MICHIGAN CITY, INDIANA

REVISION DESCRIPTION		DATE	No.

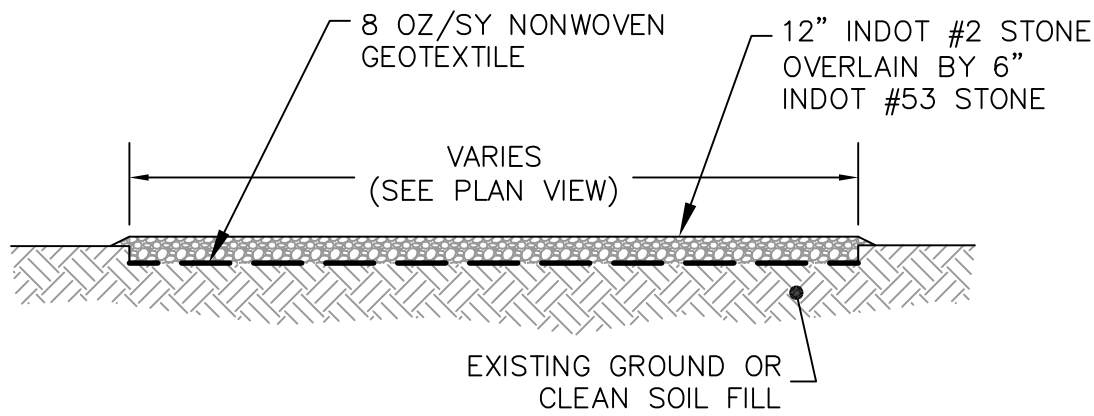


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GRANGER, INDIANA 46530  
(574)-271-3447  
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REVIEWED BY: BED  
DATE: 03/01/2019  
FILE: 1873-356-DWG  
CAD: KNP0030.dwg



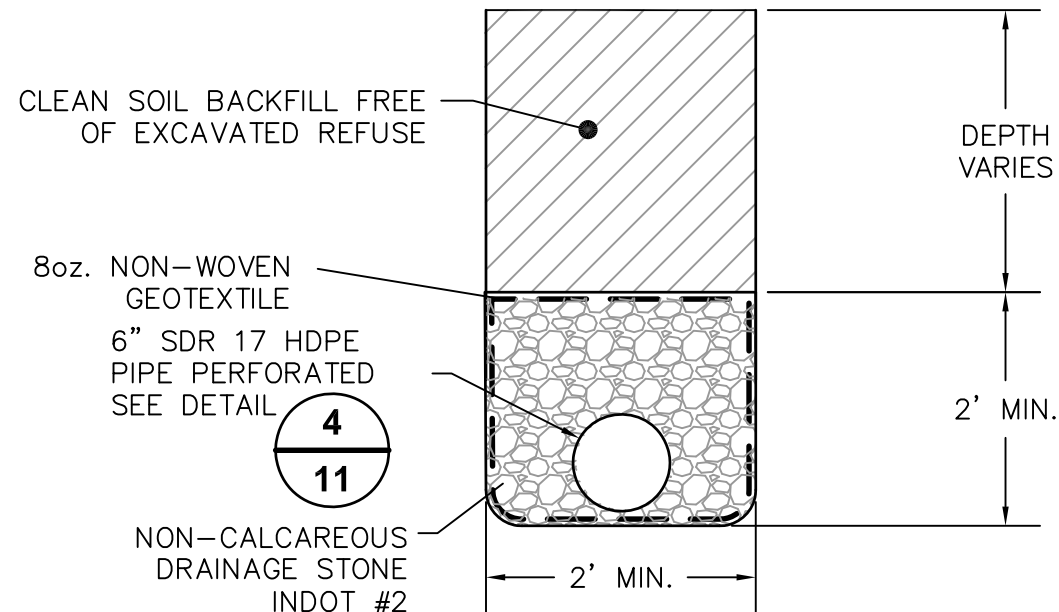


GRAVEL DRIVE

DETAIL 1  
SCALE: NOT TO SCALE 13

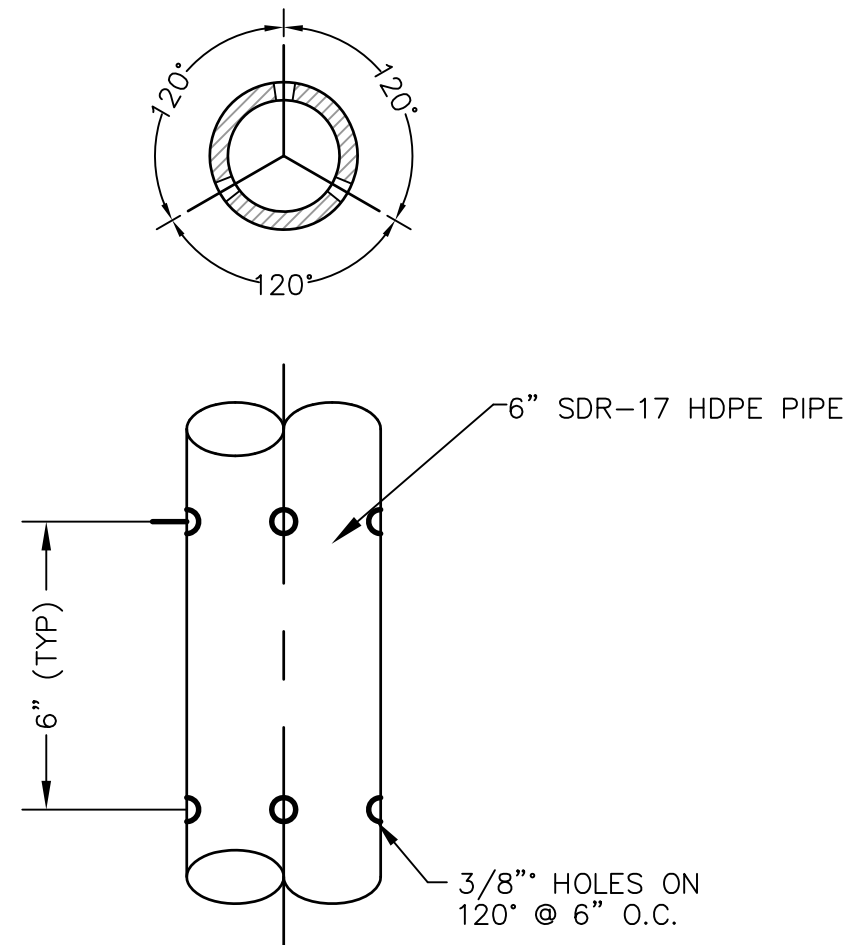
NOTES:

- EXISTING TOPSOIL/COVER SOIL SHALL BE STRIPPED A MIN. 6" DEEP FROM WITHIN PROPOSED ROAD AREA AND STOCKPILED IN A LOCATION DETERMINED BY OWNER. HAUL ROAD BACKSLOPE SHALL BE REVEGETATED WITH TOPSOIL.
- ROAD SHALL CONSIST OF AN 80Z/SY GEOTEXTILE OVERLAIN BY 12" #2'S AND 6" #53'S.



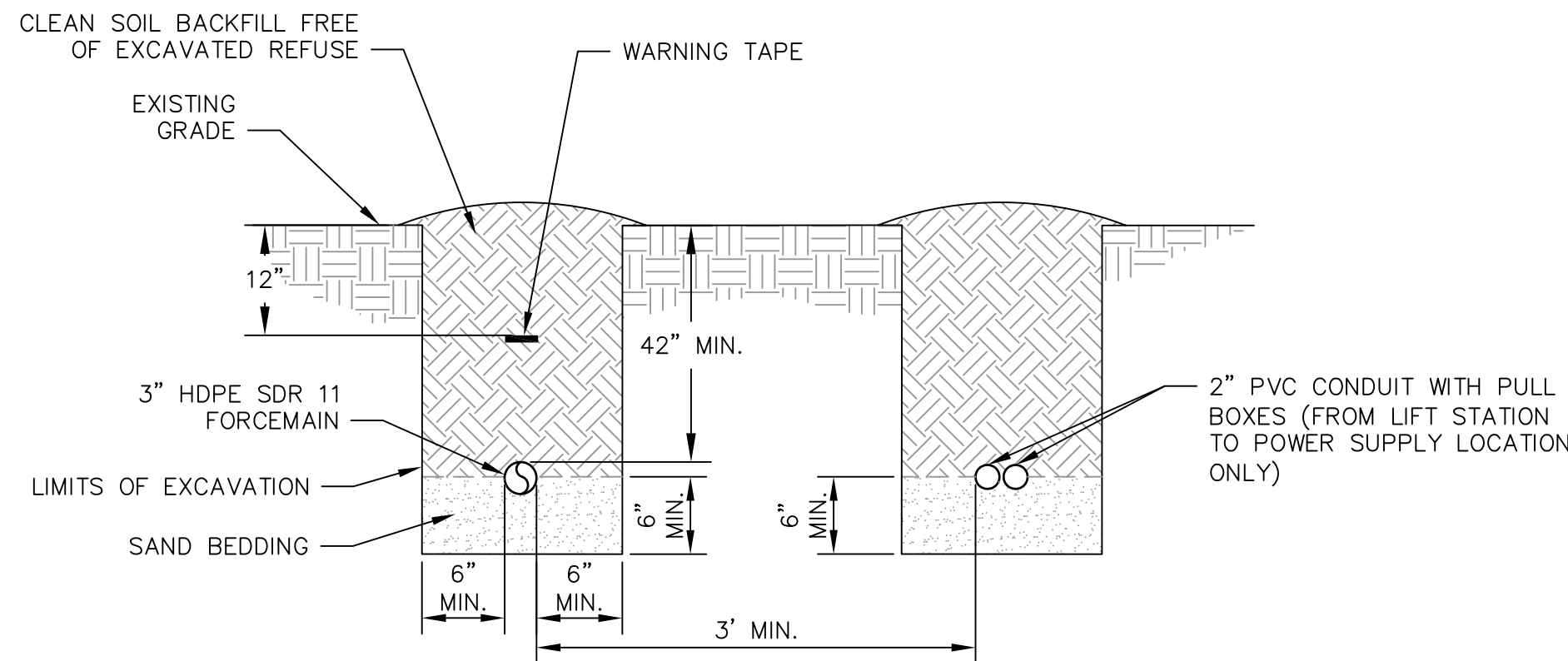
SEEP DRAIN TRENCH

DETAIL 2  
SCALE: NOT TO SCALE 13



PERFORATED LEACHATE SEEP DRAIN PIPE

DETAIL 3  
SCALE: NOT TO SCALE 13

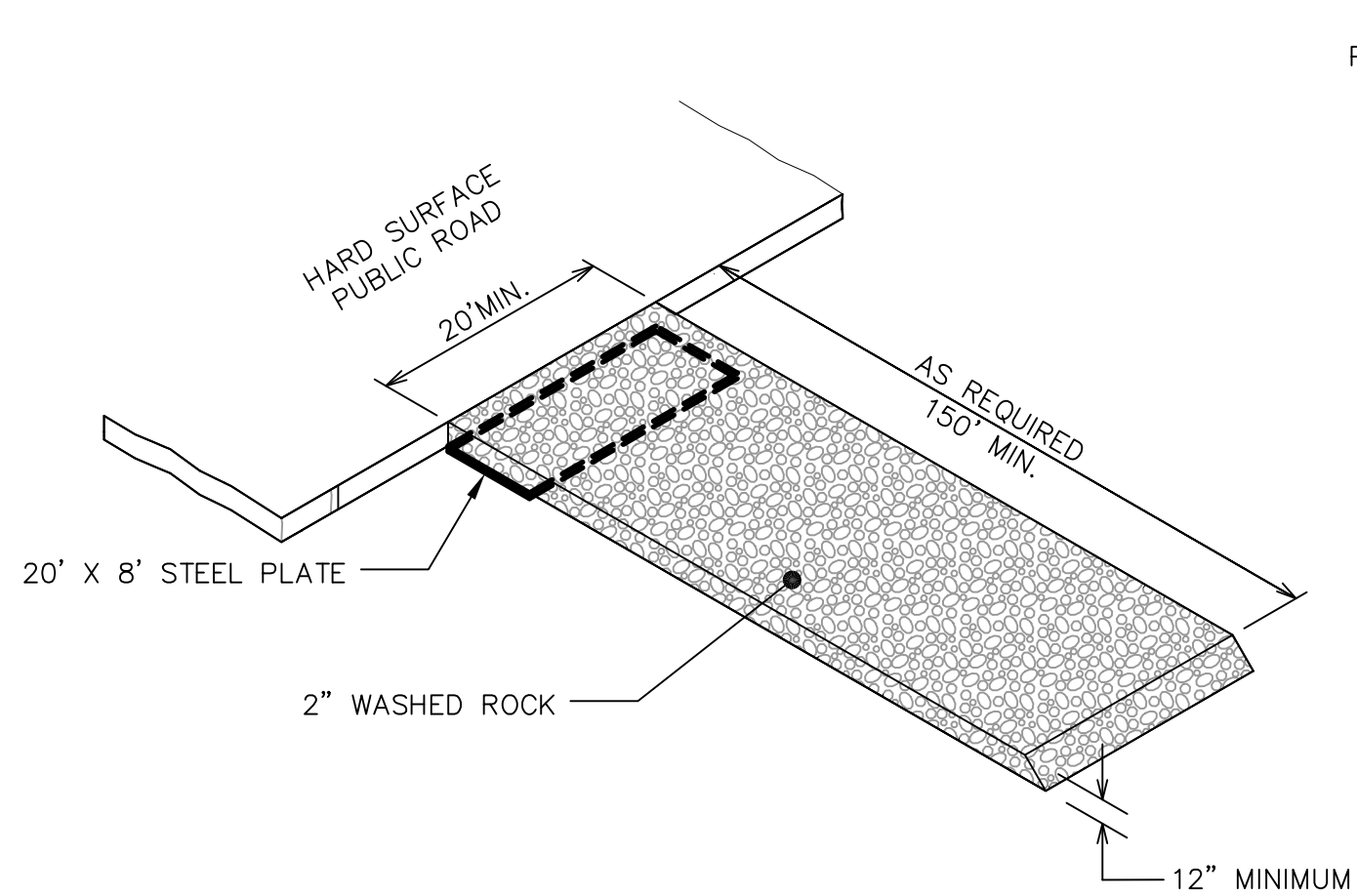


DUAL CONTAINED FORCEMAIN TRENCH (3" X6")

DETAIL 4  
SCALE: NOT TO SCALE 13

NOTE:

SAND BEDDING NOT REQUIRED FOR PORTIONS OF FORCEMAIN DIRECTIONALLY DRILLED UNDER KARWICK ROAD.

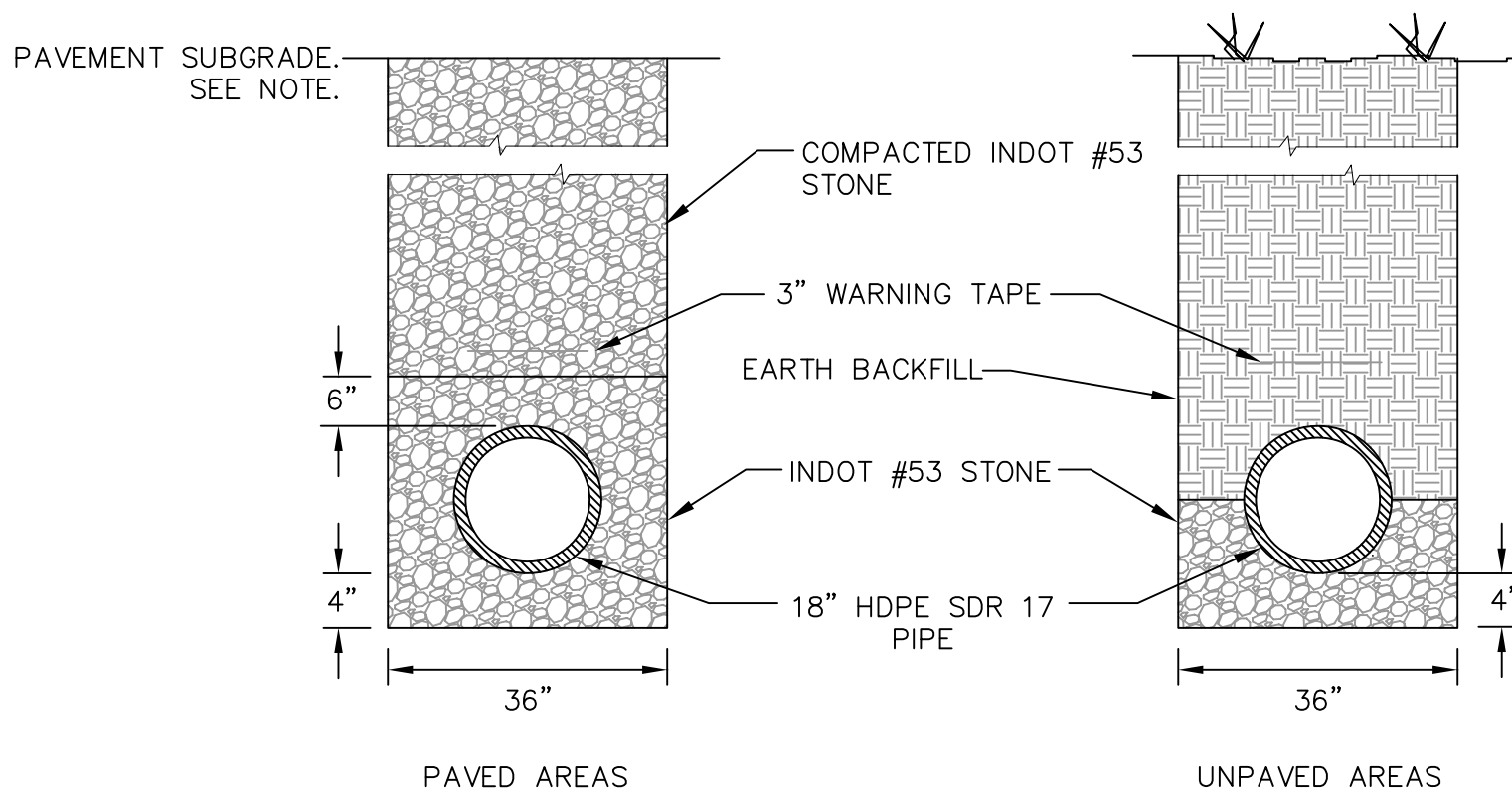


STABILIZED CONSTRUCTION ENTRANCE

DETAIL 5  
SCALE: NOT TO SCALE 13

NOTE:

CONSTRUCTION ENTRANCE SHALL REMAIN IN PLACE AND BE MAINTAINED THROUGHOUT ENTIRE PROJECT.

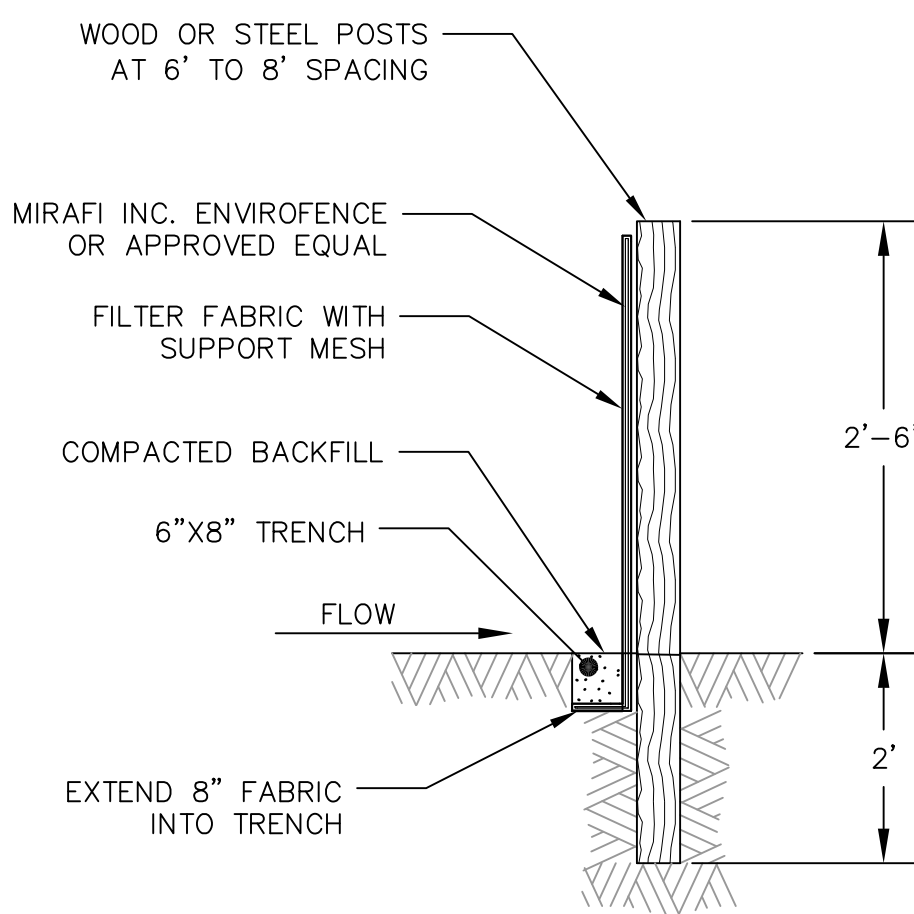


TYPICAL STORM SEWER PIPE TRENCH SECTIONS

DETAIL 6  
SCALE: NOT TO SCALE 13

NOTE:

PAVEMENT WILL BE OPEN CUT AND THE PAVEMENT SHALL BE RESTORED TO ORIGINAL CONDITION.

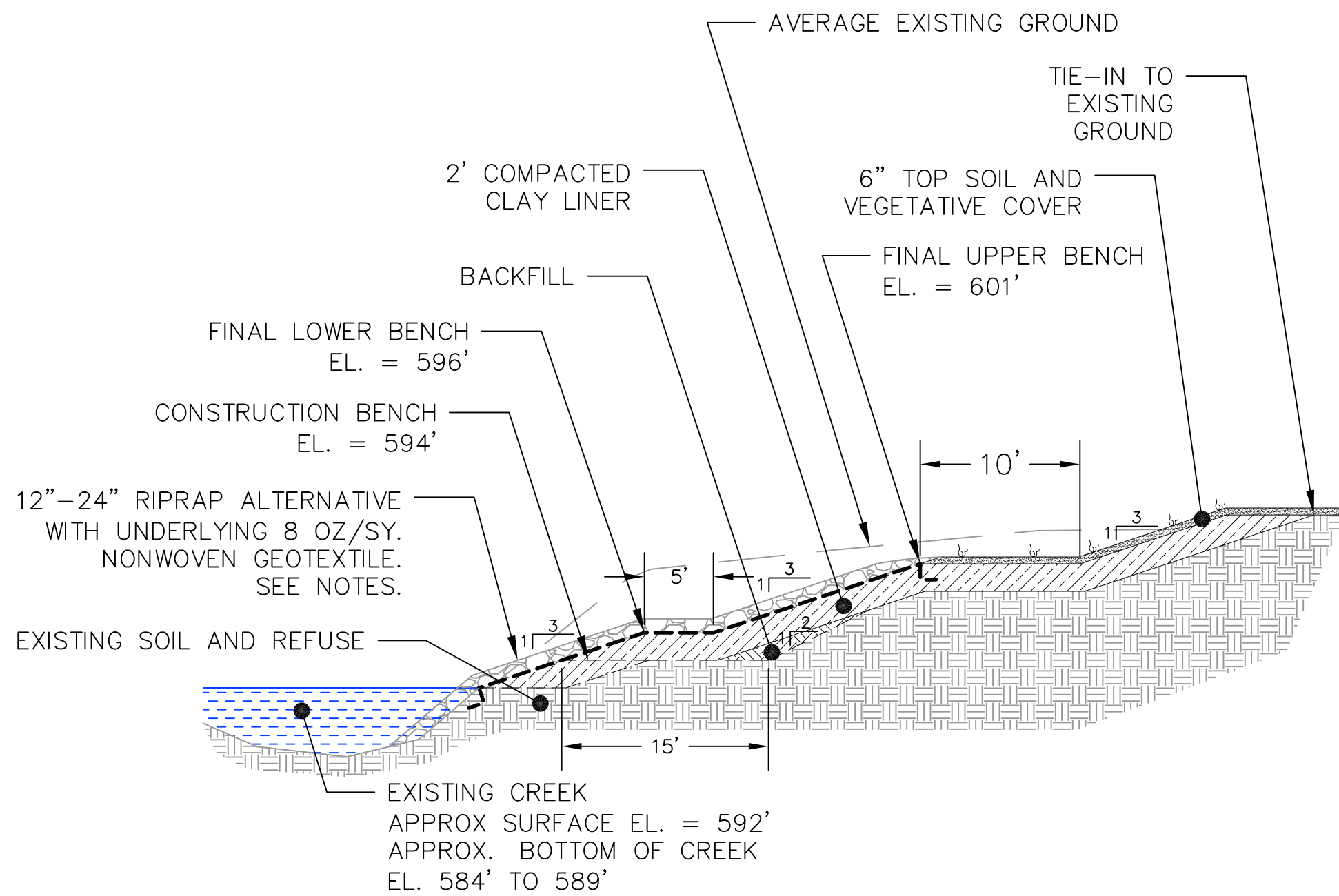


SILT FENCE

DETAIL 7  
SCALE: NOT TO SCALE 13

NOTES:

- FILTER BARRIERS SHALL BE PLACED WHERE SHOWN ON THE PLANS AND WHERE INDICATED BY THE ENGINEER.
- SEDIMENT TRAPPED BY THE FENCE SHALL BE REMOVED (AND PROPERLY DISPOSED OF) WHENEVER SIGNIFICANT ACCUMULATION OCCURS.
- BARRIERS SHALL BE MAINTAINED IN PLACE UNTIL THE UPSLOPE AREA HAS BEEN STABILIZED AND REMOVAL IS AUTHORIZED BY THE ENGINEER.



BANK CROSS SECTION - RIPRAP ALTERNATIVE

DETAIL 8  
SCALE: NOT TO SCALE 13

NOTE:

- TRAIL CREEK DEPTHS APPROXIMATED FROM BATHYMETRIC SURVEY BY WEAVER CONSULTANTS GROUP. DRAWING TITLE "CHENEY RUN & TRAIL CREEK TOPOGRAPHIC SURVEY". DRAWING DATE 03/30/2018.
- RIPRAP TO BE PLACED BENEATH SURFACE OF CREEK AND KEYED INTO THE CREEK FLOOR AS NEEDED TO SUPPORT RIPRAP SLOPE ABOVE WATER. UTILIZE 24" MIN. RIPRAP FROM LOWER BENCH TO BOTTOM OF CREEK, TRANSITIONING TO THE 12-18" RIPRAP AT THE HIGHER BANK ELEVATIONS.
- RIPRAP SHALL BE CHOKED OFF USING A COMBINATION OF INDOT #2, #5, AND #8 STONE.

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DETAILS - 1  
CORRECTIVE ACTION  
KARWICK NATURE PARK  
MICHIGAN CITY, INDIANA

REVISION DESCRIPTION	DATE	No.

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Group

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7323 GRAFF ROAD  
GRANGER, INDIANA 46530  
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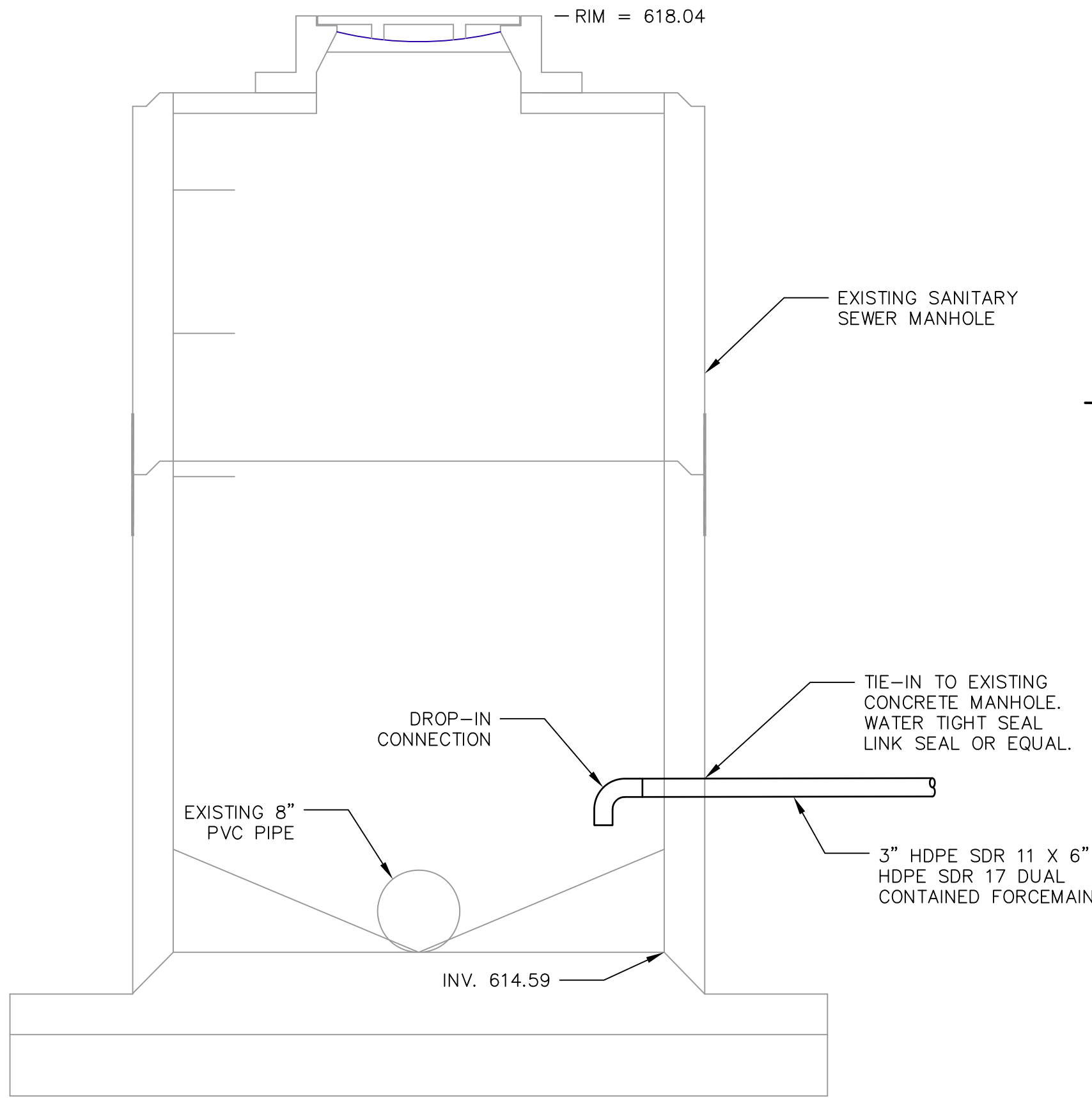
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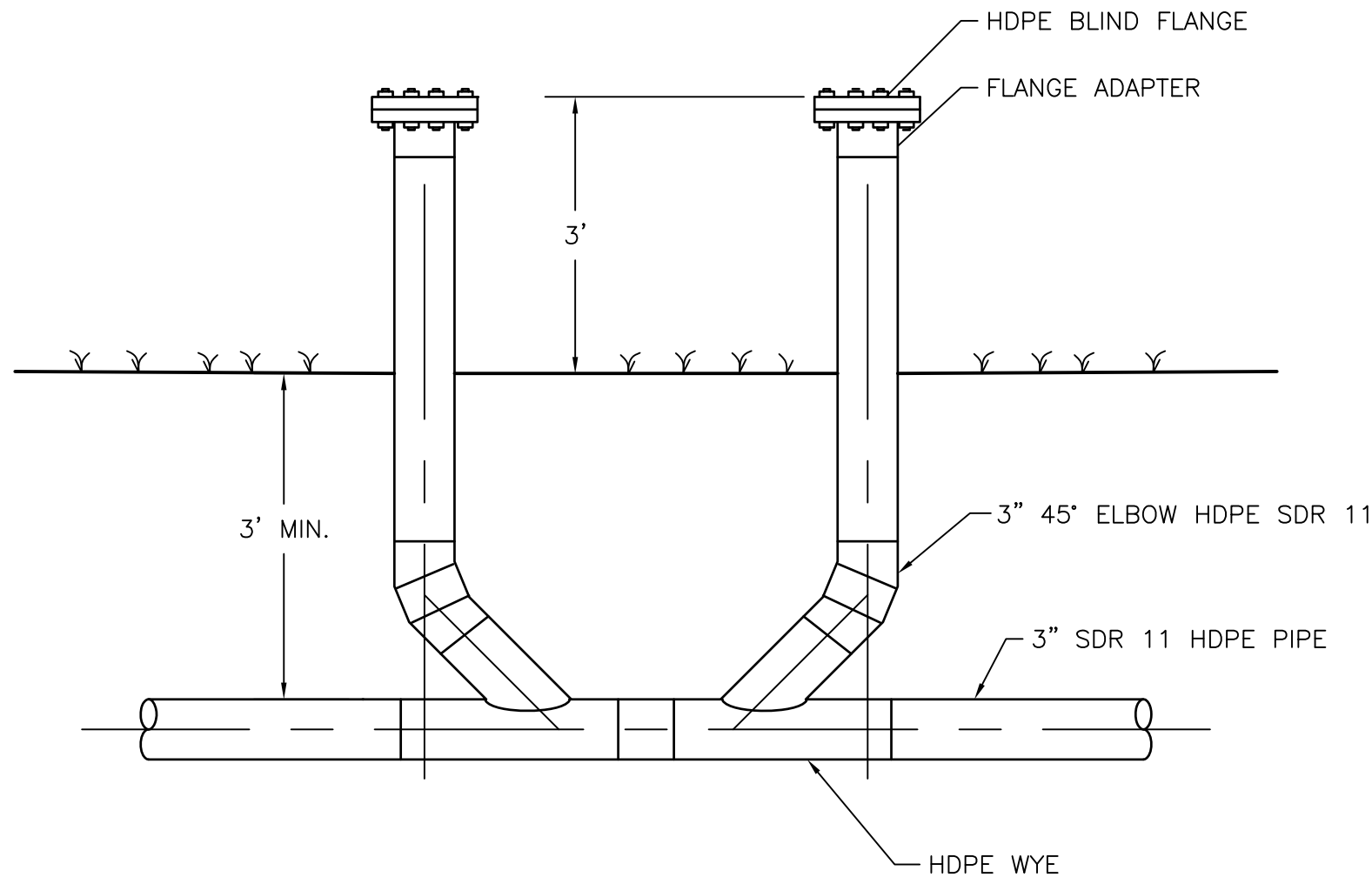
SHEET 13 OF 16





TIE-IN TO EXISTING SANITARY SEWER MANHOLE

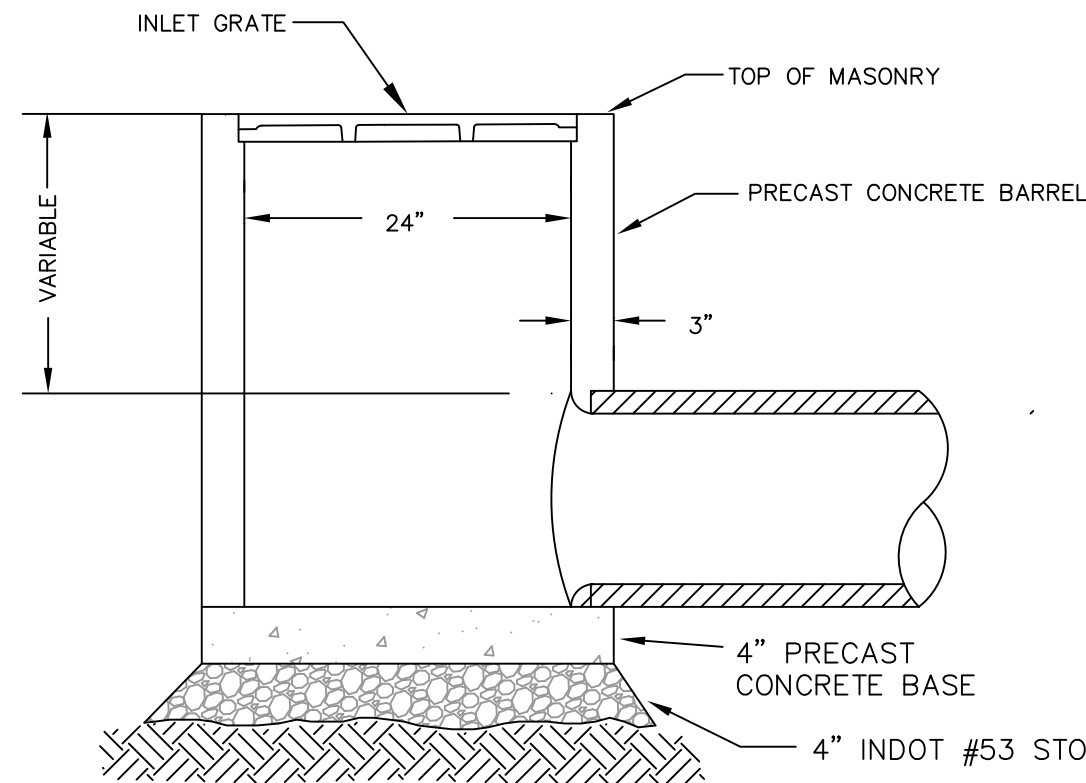
DETAIL  
SCALE: NOT TO SCALE 1/14



FORCEMAIN CLEANOUT

DETAIL  
SCALE: NOT TO SCALE 2/14

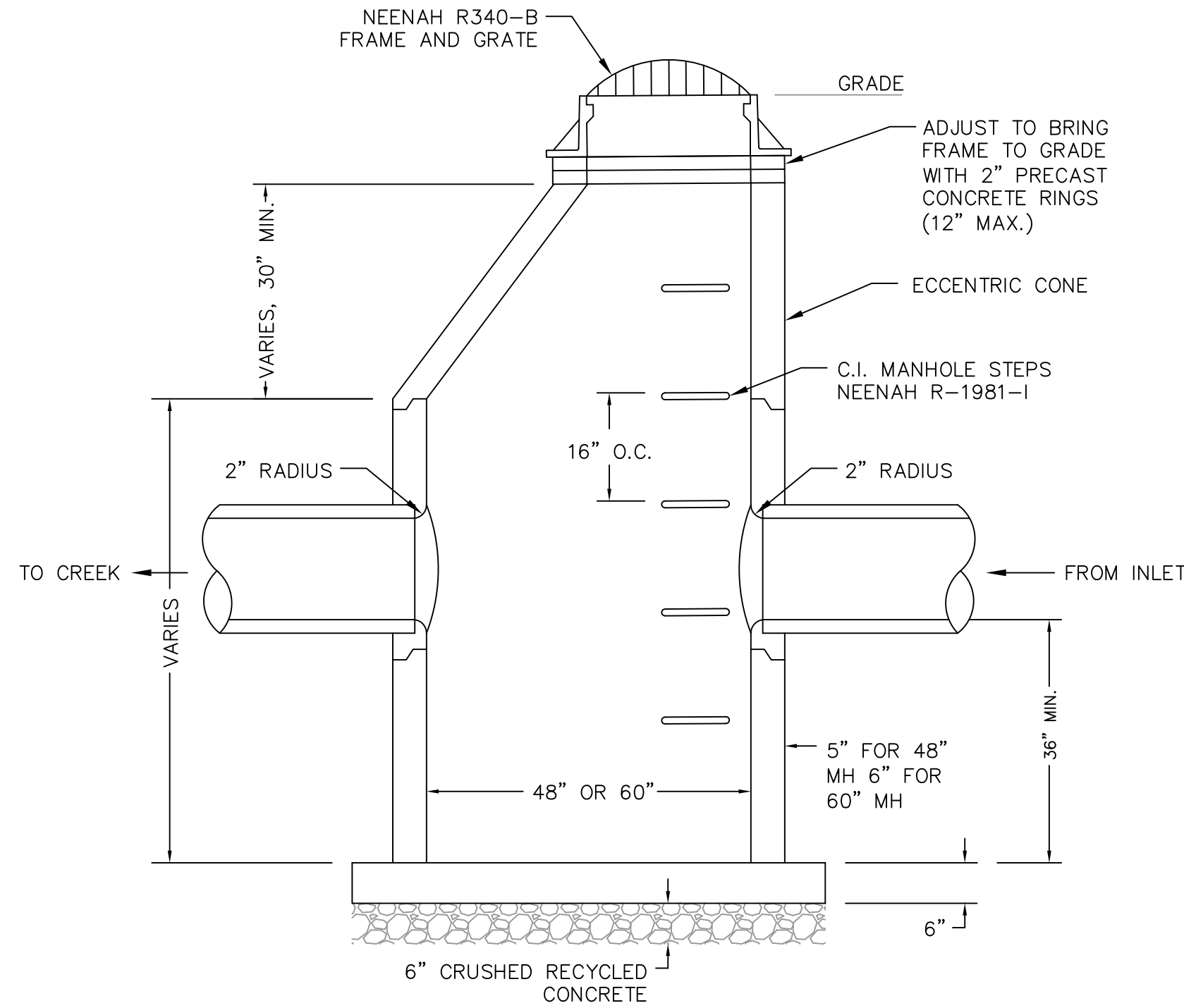
NOTE:  
CLEANOUTS IN PAVED AREA SHALL BE FLUSH MOUNTED TO PAVEMENT SURFACE.



INLET

DETAIL  
SCALE: NOT TO SCALE 3/14

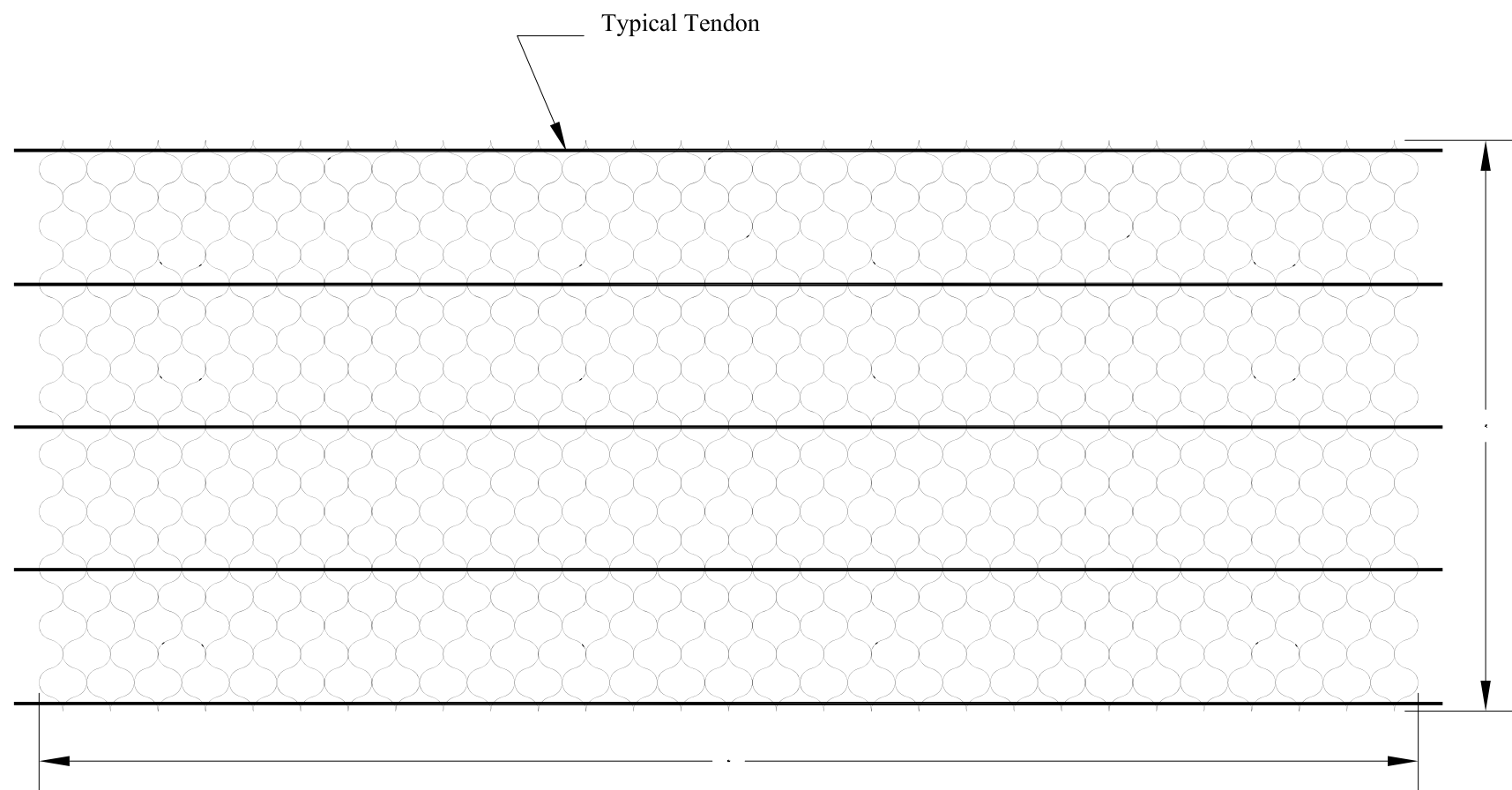
NOTES:  
1. PRE-CAST REINFORCED CONCRETE RISER RINGS SHALL COMPLY WITH ASTM C-39.  
2. ALL JOINTS BETWEEN PRE-CAST ELEMENTS, ADJUSTING RINGS AND MANHOLE FRAMES SHALL BE SET IN PLACE WITH A BUTYL RUBBER JOINT SEALANT.



CATCH BASIN

DETAIL  
SCALE: NOT TO SCALE 4/14

NOTES:  
1. PRE-CAST REINFORCED CONCRETE RISER RINGS AND DOMES SHALL COMPLY WITH ASTM C-39.  
2. ALL JOINTS BETWEEN PRE-CAST ELEMENTS, ADJUSTING RINGS AND MANHOLE FRAMES SHALL BE SET IN PLACE WITH A BUTYL RUBBER JOINT SEALANT.  
3. FOR SHALLOW CATCH BASINS, OMIT PRE-CAST CONE SECTION AND PROVIDE 8" THICK FLAT TOP CONCRETE SLAB WITH 24" ECCENTRIC OPENING.  
4. ALL CASTING GRADE ADJUSTMENTS SHALL FOLLOW INDOT PREVAILING SPECIFICATIONS, SECTION 720.04.



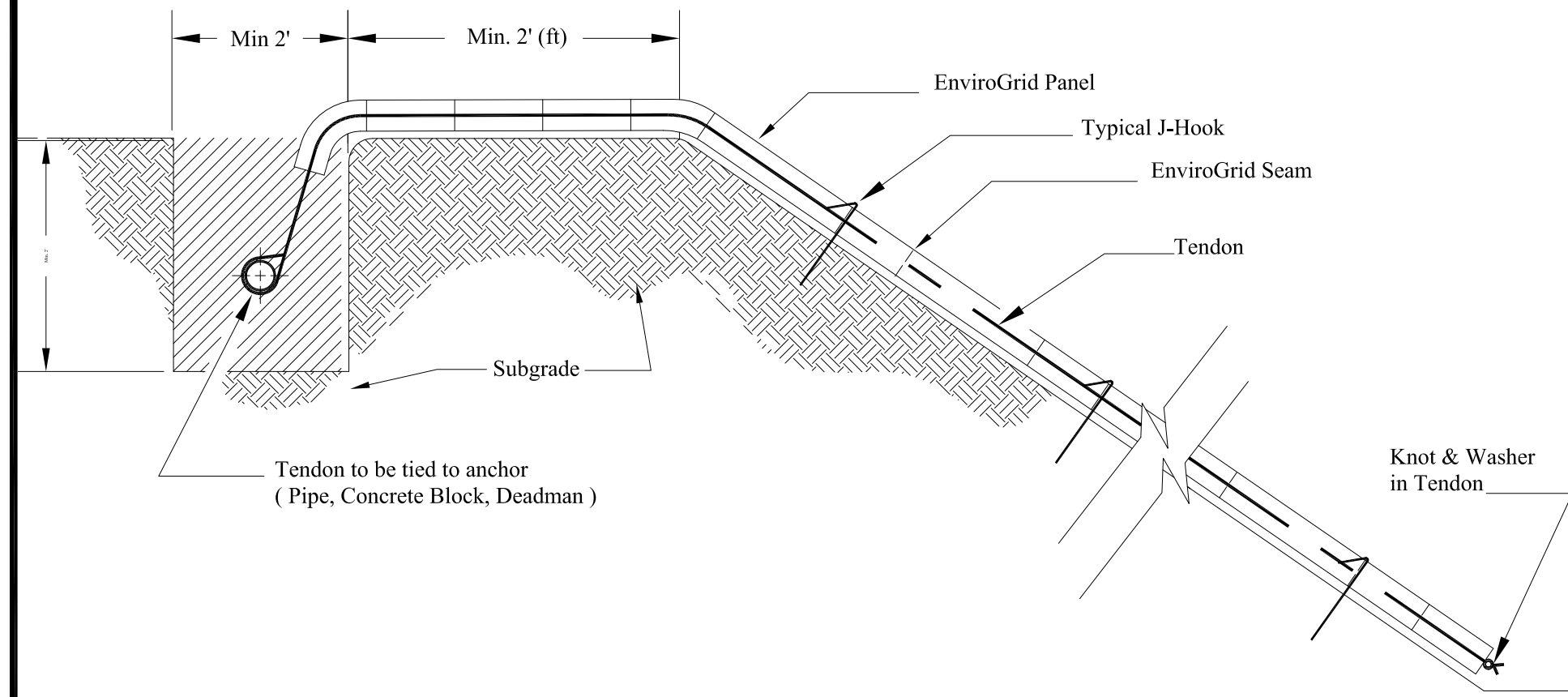
NOTES:  
Five-Tendon System

ENVIROGRID

By TKP EGA 20 - Cell - w/ 5 tendons Rev # 0  
Scale: None Date: 10-21-03 Drawing No. EnvStd-022

EGA 20 - CELL WITH 5 TENDONS

DETAIL  
SCALE: NOT TO SCALE 5/14



NOTES:  
Over Subgrade

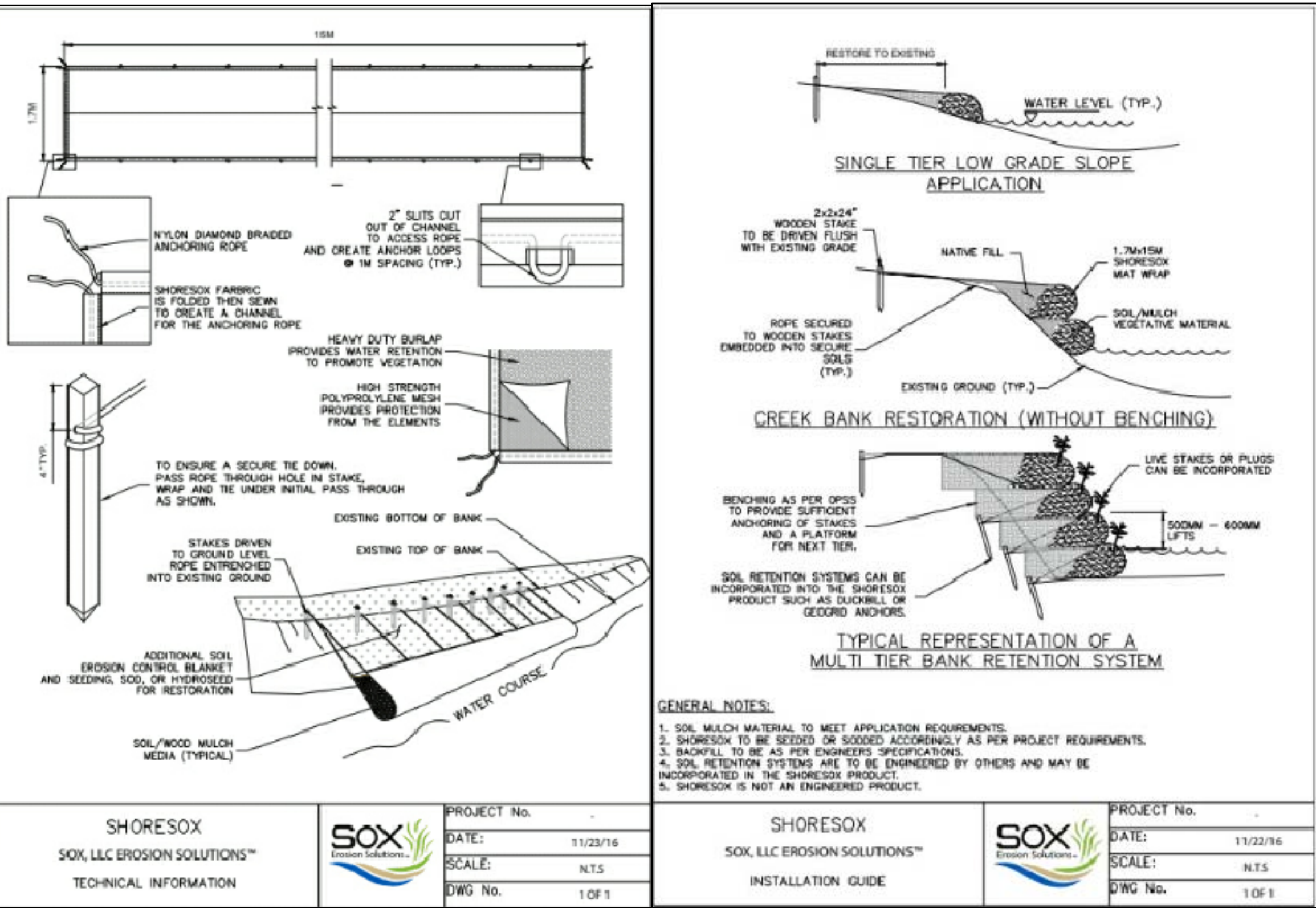
ENVIROGRID

By TKP Typical Slope Application Rev # 0  
Scale: None Date: 11-01-02 Drawing No. EnvStd-014

EGA 20 - TYPICAL SLOPE APPLICATION

DETAIL  
SCALE: NOT TO SCALE 6/14

NOTE:  
ENVIROGRID WILL HAVE 6" DEEP CELLS. THE CELLS SHALL BE BACKFILLED WITH CONCRETE GROUT BELOW THE HIGH WATER LINE AND SHALL BE BACKFILLED WITH TOPSOIL ABOVE THE HIGH WATER ELEVATION (601').



SHORESUX TECHNICAL INFORMATION

DETAIL  
SCALE: NOT TO SCALE 7/14

SHORESUX INSTALLATION GUIDE

DETAIL  
SCALE: NOT TO SCALE 8/14

NOTE:  
SHORESUX MULCH BACKFILL SHALL BE COMPRISED OF CHIPPED ON-SITE TREE MATERIAL MIXED WITH COMPOST, OR BIOSOLIDS PROVIDED BY THE SANITARY DISTRICT.

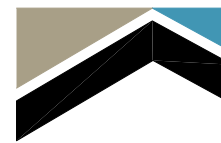
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DETAILS - 2  
CORRECTIVE ACTION  
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MICHIGAN CITY, INDIANA

REVISION DESCRIPTION	DATE

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SHEET 14 OF 16







K:\Weaver\Client Information\1800-1879\1879-356\DWG\KNP0030.dwg, Job Number: 1800-1879-356, Date: 11/1/2019

SCOPE:

This work will consist of establishing adapted and compatible native and introduced trees and shrubs for forest products, wildlife habitat, erosion control and water quality, treating waste, storing carbon, energy conservation, improving or restoring natural diversity, and enhancing aesthetics.

GENERAL SPECIFICATIONS APPLICABLE TO ALL PURPOSES

Planting Plan The planting plan will be recorded in an acceptable format and will include the natural community type if applicable, species and sizes, numbers to be planted, spacing, locations and specifications for protection if applicable.

Locally developed, native Indiana plant materials or seeds in accordance with permit conditions should be considered for planting. Do not order or plant species developed outside of Indiana which are uncommon or rare in the State. This will maintain the genetic integrity of these species .

Plant Material Descriptions

Bare-root Stock — woody plant seedlings lifted from the nursery soil and delivered with their roots bare of soil. Readily available and commonly planted throughout northern Indiana. Various sizes.

Tubelings — woody plant seedling grown in plastic "plug" containers with small amount of soil. While a type of 'container grown' plant material they are unique enough to be treated separately.

Container Grown/Balled—Burlapped — woody plant seedlings and saplings grown and delivered in soil; either plastic container or wrapped in burlap. Generally larger sizes.

Live stakes — living woody plant cuttings capable of quickly rooting in moist soils; generally ½ – 2 inches in diameter and 1–3 feet long and large enough to be tamped-in as stakes . Typically used for bioengineering but may be used in other moist soil conditions.

Whips — living woody plant cuttings capable of rooting in moist soils and usually assembled into bundles called wattles or fascines; generally ¼ – 1 inch diameter and 3–4 feet in length. Typically used for bioengineering but may be used in other moist soil conditions.

Wattles — bundles of whip cuttings bound together into sausage-like structures capable of rooting in moist soils; generally wattles are at least 3–4 feet long. Typically used for bioengineering by placing in trenches and securing with live stakes.

Fascines — bundles of whip cuttings bound together into sausage-like structures capable of rooting in moist soils; generally fascines are 5–20 feet long. Typically used for bioengineering by placing in trenches and securing with live stakes .

Site Preparation/Weed Control for Establishment

Determine the level of preparation and weed control based upon the site conditions and plant materials. In prior crop fields it is unlikely that weed control or mats will be necessary but in prior hayfield it may be necessary due to the tall grass; particularly if planting small bare root stock. If planting tall trees (4 feet or more) weed mats are likely unnecessary.

Eliminate all competing vegetation in all seeded areas to be direct seeded prior to planting. If fabric weed barriers are used, the following shall apply:

1. Barrier must be a minimum of 9 sq.ft./plant.
2. Barrier must be permeable to water and be guaranteed by manufacturer to last a minimum of 3 years when exposed to sunlight.
3. Barrier shall be capable of inhibiting all underlying plant growth.
4. Barrier must be pinned and otherwise installed according to manufacturer's specifications.

If tillage is used for weed control, care must be taken not to damage plant stems. Keep tillage depths shallow to avoid root damage.

Mowing or cutting of weeds or grass is not an acceptable means of weed control around woody plantings.

Herbicide may be used and applied according to label instructions .

PLANTING DATES

Bare-rooted stock and tubelings shall be planted during the dormant season in the spring after the ground thaws until May 30 as soil moisture and local weather conditions permit. Care should be taken to plant leafed-out tubelings in May after danger of frost has passed. Fall planting may be done after October 1 until the ground freezes when soil moisture is adequate. Fall planting of bare- rooted stock will not be done on soils subject to frost—heave action (clays, clay loam, silty clay loams, silts, silt loams, and loams). . %131

Balled and burlapped or container-grown stock shall be planted October 1 to May 30 as local soil moisture and weather conditions permit. Fall planting may be done after October 1 until the ground freezes when soil moisture is adequate. Stock may be planted later in summer if it will be watered on a regular basis . . %131

Cuttings, including live stakes, wattles and fascines, shall be planted during the dormant season; generally from October 15th through April 30th. This is intended to capture the time period from after the first hard frost and leaf drop in late fall before the ground freezes to before bud swell in early spring. Cuttings may be planted as soon as the ground thaws. The spring planting date may be extended to the end of May if cuttings have been in cold storage.

Direct seeding shall be completed from October 1 through April 30 depending on local soil moisture, target species dispersal date and as weather conditions permit. Spring seeding of some heavy seeded species may reduce rodent and insect damage. Fall seeding may eliminate the need for seed stratification and seed storage but may increase loss to rodents and other pests.

Minimum Planting Stock Size

Bare root stock should be 12 inches or more in total length. Generally this will be size "1-0" size which is one year old. Seedlings are often described as 1-0, 2-0 and 3-0. The first number refers to the number of years grown in a nursery seedling bed and the second to the number of years in a transplant nursery bed. Transplants are commonly designated as 2-1, 2-2, and 3-2. The total age of the plant is the sum of the two numbers. For example, 1-0 refers to a 1-year-old seedling and 2-2 to a 4-year-old transplant.

CUTTINGS:

"Whips" for wattles and fascines should be ¼ to 1 inch diameter and 3–4 feet in length. Live stake size should be ½ to 2 inch diameter and 12–24 inch length. Use longer lengths to increase chance of success.

Storage, Care and Handling of Woody Planting Stock

Planting stock roots will be protected from desiccation (drying) during temporary storage and handling prior to and during planting . Stock will be kept in a cool environment out of direct sunlight and wind.

Keep seedlings in shipping container and place in cold storage at 35 degrees to 45 degrees F. If cold storage is not feasible, heel in planting stock (see figure 1) for a period not to exceed 2 weeks. Follow supplier's direction which may include "sweating" or forcing some species out of dormancy and into bud break before planting.

Roots of bare-rooted stock shall be kept moist and protected from freezing during planting operations by placing in a water-soil (mud) slurry, peat moss, sphagnum moss, superabsorbent (e.g., polyacrylamide) slurry or other equivalent material. (Note: Do not soak trees in water for more than 8 hours.).

Rooting medium of containerized and balled and burlapped stock shall be protected from excessive heat and freezing and kept moist at all times by periodic watering.

Whips and live stakes can be sprayed with water to help keep them moist prior to bagging for storage. Bags should be made of fairly rugged plastic. Addition of moist peat moss to the bag prior to tying the top is desirable. Cuttings should fit comfortably inside the bags. Bags should be heavy enough to prevent punctures which tend to occur when handling bagged cuttings. Bags should be able to retain moisture around the cuttings. Cuttings can be stored in the dark, at temperatures approximately 33–40 F for 3–4 months without any significant reduction in establishment success. Whether cuttings are kept in a cooler, root cellar, or snowbank, make sure the storage area is dark, moist and cool at all times.

Plant Material Collection – Cuttings

Cuttings — Live Stakes and Whips

The best cuttings are those which are fairly straight and have few branches which necessitates trimming. The best wood is 2–7 year old with smooth bark that is not split or furrowed. Use sharp hand tools to make clean cuts and limit damage to bark. Side branches should be removed. Live stake tops should be cut square so they can be tamped or pushed into the soil. Live stake basal ends (lower portion cut from tree or shrub) should be cut angled to allow for easy insertion in soil. Cutting the live stakes in this fashion will eliminate confusion as to which end is up for planting.

Emphasis should be placed on obtaining quality materials with no obvious insect or disease problems.

Cuttings should be collected in the dormant season. The dormant season is after the first hard frost and leaf drop in fall and before bud swell in spring (roughly October 15th through April 30th). Keep the cuttings cool and moist until planting (see storage and handling section above). To minimize storage time, harvest cuttings in late winter to early spring and plant immediately when possible.

Length and Thickness of Cuttings: Basal diameter for whips should be a minimum of ¼ – 1 inch in diameter and 3–4 feet in length. Basal diameter for live stakes should be ½ –2 inch diameter and 12–24 inches long. Generally, larger diameter cuttings are better as they ensure a large supply of stored energy in the stem which improves establishment success. Also, longer cuttings (~4 feet) usually experience greater rooting success than shorter (2 foot) cuttings. The longer length allows cuttings to be planted deeper and into the mid-summer moisture zone. Cuttings planted into soil which dries out below the cutting and its developing roots have poor survival rates . Plant materials center trials have shown that large poles from 3–8 inch diameter have been very successful.

Planting Requirements for Woody Planting Stock

Stock shall not be planted when the soil is frozen or dry. Rooted stock will be planted in a vertical position with the root collars approximately level with or slightly below (0.5 inch or less) the existing ground line. Planting depth should mimic the depth grown at the nursery.

Seedlings: The planting trench or hole must be deep and wide enough to permit roots to spread out and down without doubling, J-rooting or L- rooting. If the roots are too long for the planting equipment, minimal pruning of small end roots may be needed. Do not prune back into the main root system or more than 25% of the total root length. Prune out any diseased root branches. Pack soil around each plant firmly to eliminate air pockets after planting.

Cuttings (Whips and Live Stakes): Using cuttings of willow and other woody shrubs and trees that root from the stem is a successful and inexpensive treatment in moist soil conditions. Planting of hardwood cuttings will be limited to shrub and black willow, red osier and silky dogwood, cottonwood and balsam poplar. See VT Forestry Technical Note 2 – VT Trees and Shrubs for Conservation for more information. Willow and dogwood are the typical species planted and available in Vermont. Plant cuttings within 2 days of collection or shipping arrival in the spring through April 30th. Planting may be done as late as the end of May if cuttings have been in cold storage.

Containerized trees: Dig a hole slightly larger than the container diameter. Gently remove plants from containers before placing in the ground and firmly pack soil around roots to eliminate air pockets. Before planting, loosen any spiraling or compacted roots. Water should be applied generously.

Balled and burlapped trees: When handling stock, never lift a tree at the stems or trunk. Handle stock at the root ball. Dig a hole 1 1/2 times as wide as the root ball and about the same depth as the root ball. Remove any rope, wire, or plastic twine from the tree. Pull back burlap around trunk and fold down once in the hole. Carefully place the tree in the hole and firmly pack soil around roots to eliminate air pockets. Water should be applied generously.

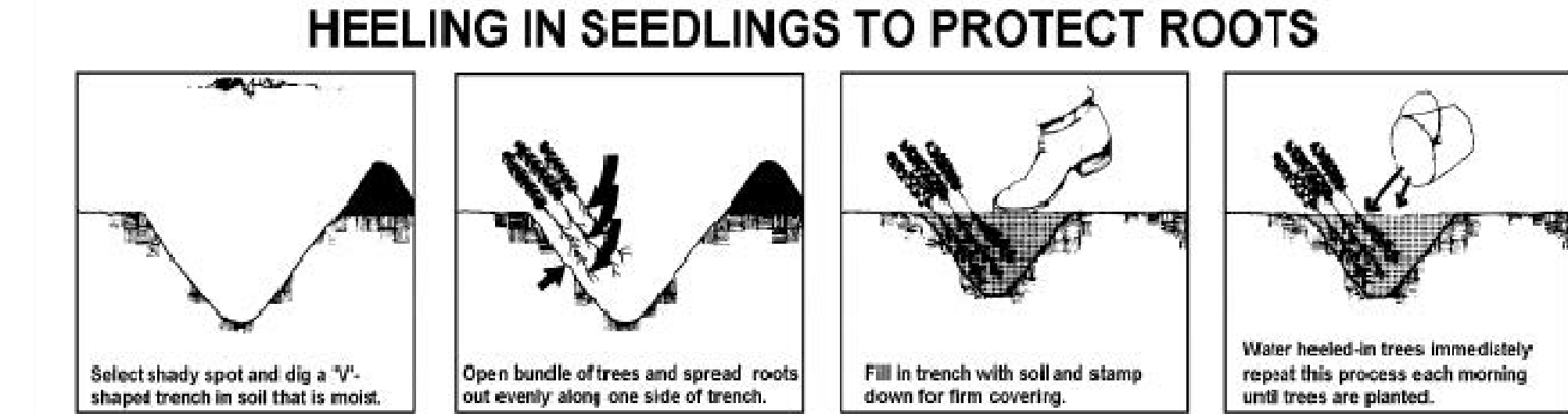


Figure 1. Heeling In Method. (Source: Tree Planting Notes, Minnesota Department of Natural Resources, Division of Forestry.)

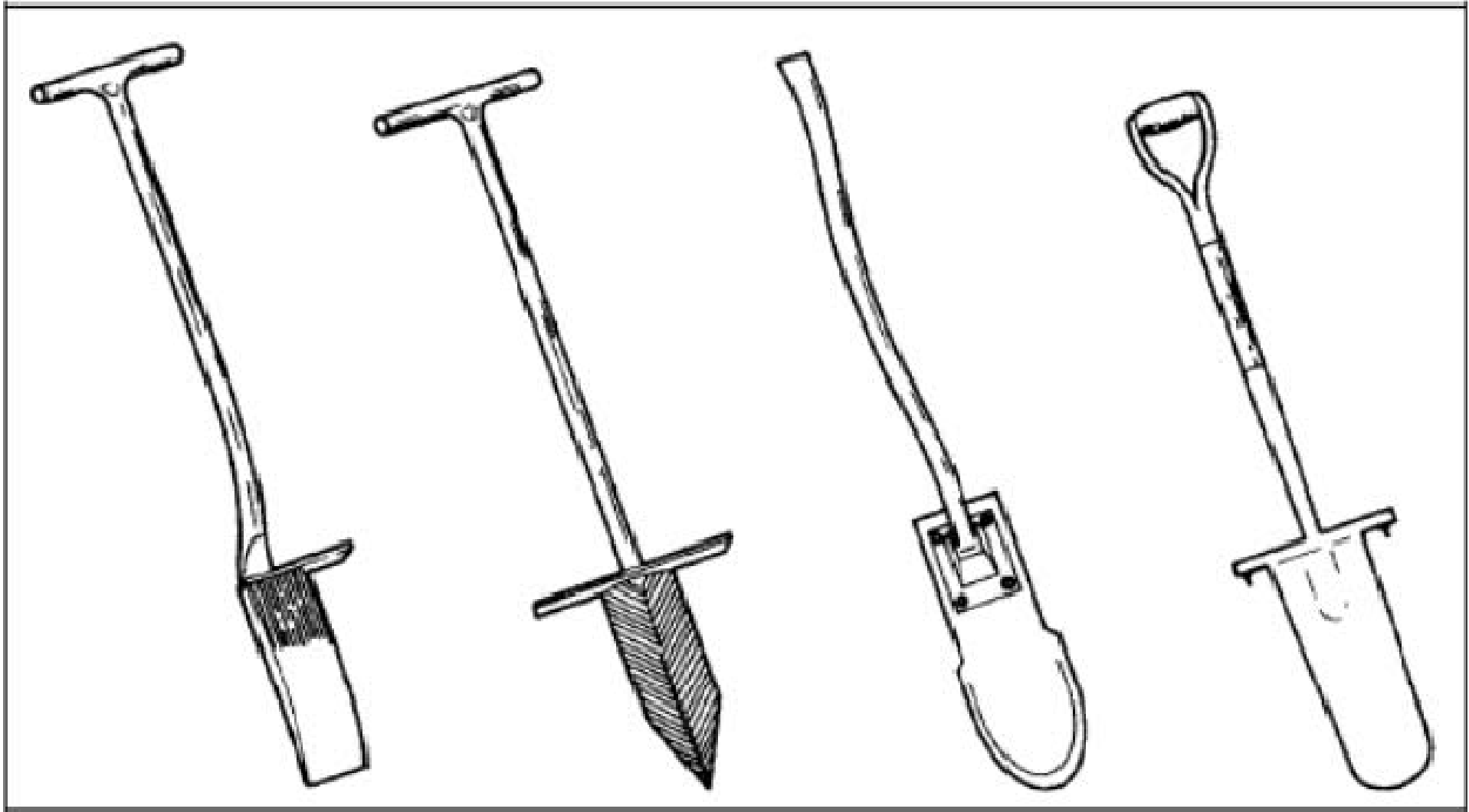


Figure 2. Four tree-planting tools (left to right): planting bar, a pointed planting bar useful in stony soils, the Rindi grub-hoe (L-shaped) for making straight-sided planting holes, and a tile spade planting shovel for digging deep holes for large planting stock. (Source: The Practice of Silviculture, Smith, 1986.)

PLANTING TECHNIQUES

Small Seedlings

The two primary methods of planting smaller seedlings and bare root stock are slit method and side-hole method. These techniques are suitable when the root system is small enough so that it is not doubled over in the hole created by the tools. Figure 2 (below) shows some tree planting tools such as planting/dibble bars and shovels.

Slit Method: This method (See Figure 3) consists of making a slit in the ground with a planting bar, shovel or other suitable tool. This technique is much more rapid than side-hole method. After planting the tree in the slit, the bar is re-inserted several inches away, rocked away from the plant to kick in the soil at the bottom of the roots, and then rocked toward the plant to compress the soil around the base of the plant. The planter will then firm the soil around the plant with their feet.

Side-Hole Method: This method consists of digging a hole with a mattock or grub hoe deep enough to hold the roots of the tree (see Figure 4). This approach can work on larger seedlings and most bare root stock. Drive the tool into the ground and rock it to create a wedge-shaped hole and place the plant at the proper depth. Be sure to hold the plant at the proper depth when backfilling and compacting the soil so as to prevent plant settling below the root collar. If the roots are too long then deepen the hole rather than bending roots into a "J" shape. Firm the soil around the plant with the feet.

Large Seedlings/Small Saplings

The primary methods of planting large seedlings and small saplings are with planting tools such as a tile spade or light mechanical equipment such as a gas powered auger or light excavation equipment. These techniques are used when the plant material is too large for smaller planting equipment and a larger hole is necessary to accommodate large root systems. Follow the guidelines under the previous section Planting Requirements for Woody Planting Stock. Cultural resource review is required when digging below the plow zone (8–12 inches).

Cuttings – Whips and Live Stakes

It is strongly recommended to soak cuttings in water for 1–2 days before planting. Soaking has been shown to significantly increase the survival rate of the cuttings. They should also be kept cool and moist in water during the planting operation.

Cuttings will be hand planted under optimum moisture conditions. Live stakes will be planted vertically with the buds pointing upward.

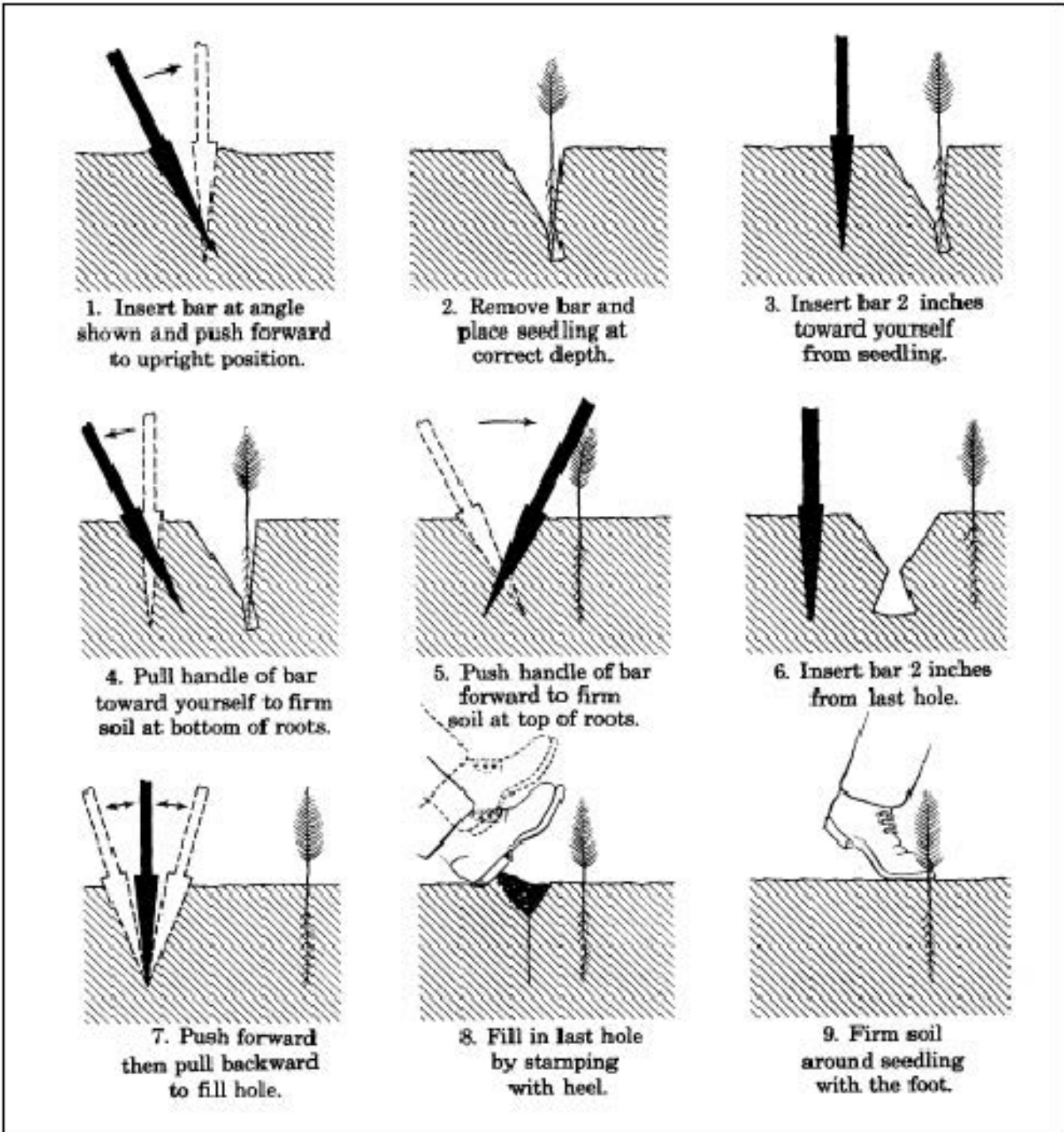


Figure 3. Slit Method. Steps in the use of the slit method of planting seedlings. (Sketch by U.S. Forest Service.)

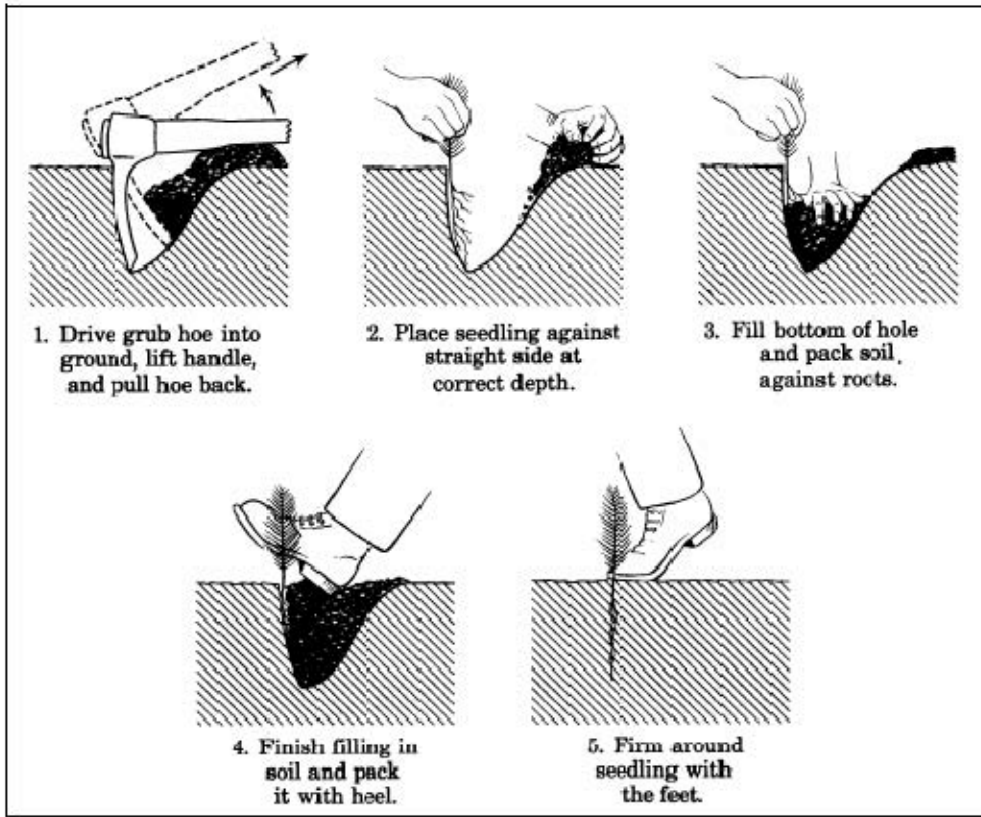


Figure 4. The Side-Hole Method of Planting. (Sketch adapted from U.S. Forest Service and The Practice of Silviculture, Smith, 1986.)

Protection

Tree shelters can help with the establishment of trees in many situations. They physically protect the plant from browsing by deer and girdling by rodents. They have also been shown to increase growth rates by creating a favorable microclimate with increased moisture and CO2. Finally, managing competing vegetation will be much easier with the plant protected by the shelter (e.g. herbicide, etc). The use of shelters is probably the most important protective measure a landowner can use to help with planting. To provide these benefits, correct installation is critical.

Because of the relative absence of moisture stress, sheltered seedlings can grow later into the season, making them susceptible to die-back in cold winters. This is a temporary effect; re-growth in the following year will usually harden off properly.

Two to three foot tree tubes will be used to guard against rodents or rabbits at an elevation at or above 595 feet msl. Frequently flooded riparian areas may lead to maintenance problems with the shelter and/or contribute to plant damage.

The base of a tree shelter must be placed at least an inch into the soil to avoid a chimney effect, which increases moisture loss and also allows entry by rodents. Tree shelters are then secured to a rot-resistant stake. Tree shelters will be assembled and installed according to manufacturer instructions .

Most tree shelters do not decompose and should be removed 2 to 3 years after plants emerge from them or when the trunk diameter grows beyond 2 inches. When the bark begins to grow against the shelter, the tree can develop cankers and fungus that threaten the health of the tree.

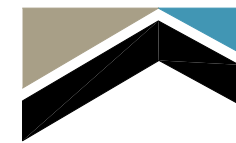
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