



**WORK SESSION MEETING
AMENDED AGENDA
CITY OF CREVE COEUR
CITY COUNCIL
300 NORTH NEW BALLAS RD
AUGUST 25, 2014
6:00 PM**

CALL TO ORDER

ROLL CALL

DISCUSSION ITEMS

STAFF REPORTS

1. Golf Course Dam and Channel Rehabilitation Report

Summary: City staff and Mark Meyer from Intuition & Logic will update the City Council regarding the need to approve additional fees and the status of the design and outlook for the repairs for the dam and silt removal from the south lake at the Creve Coeur Golf Course.

Pursuant to Section 610.022 RSMo., the City Council could, at any time during the meeting, vote to close the public meeting and move to closed session to discuss matters relating to litigation, legal actions and/or communications from the City Attorney as provided under Section 610.021(1) RSMo. and/or personnel matters under Section 610.021(13) RSMo. And/or employee matters under Section 610.021(3) RSMo. and/or real estate matters under Section 610.021(2) or other matters as permitted by Chapter 610.

Posted: _____ posted 08/22/2014
Deborah Ryan, MPCC
City Clerk



City Council
300 North New Ballas Rd
Creve-Coeur, MO 63141

SCHEDULED

Meeting: 08/25/14 06:00 PM
Department: Public Works Department
Category: Report
Prepared By: Matt Wohlberg
Department Head: Jim Heines

STAFF REPORT

Golf Course Dam and Channel Rehabilitation Report

City staff and Mark Meyer from Intuition & Logic will update the City Council regarding the need to approve additional fees and the status of the design and outlook for the repairs for the dam and silt removal from the south lake at the Creve Coeur Golf Course.



DEPARTMENT OF PUBLIC WORKS STAFF MEMORANDUM

DATE: August 21, 2014

TO: Mark Perkins, City Administrator

CC: Jim Heines, Director of Public Works

FROM: Matt Wohlberg, P.E., City Engineer

SUBJECT: Work Session Project Discussion and Update
Dam, Detention Pond, and Channel Rehabilitation Project

The plans and specifications are nearing completion for the rehabilitation of the dam and south lake at the Creve Coeur Golf Course. Staff is pleased to provide this update for the project and the outlook for future repairs to the stormwater system at the golf course.

Project Status

Four options for addressing the dam and channel issues were developed at the beginning of the design process for this project, and these essentially separated aesthetic improvements from strictly functional improvements and looked at repairing just the dam or to combine siltation removal from the pond with the dam project. Through various meetings, the Stormwater Committee, the Parks and Recreation Committee, and the Planning and Zoning Commission all voted in favor of addressing both the dam and the pond with the project and to incorporate aesthetic improvements as part of the work. The recommended option was “Option 4 – Enhanced Dam, Channel, and Lake,” as described in the attached staff recommendation to the City Council, dated October 24, 2013.

The City Council generally endorsed these recommendations at the Council work session on October 28, 2013. There was, however, some concern that the south side of the dam is not visible to many, and the Council suggested that the landscaping should be conservative in this area as a result.

The design team proceeded with the design of the project based upon this guidance. The current plan for the project (attached) closely resembles the concept presented at the October work session, with a few notable differences:

1. Dam overflow. The overflow structure for the dam (i.e. how water passes the dam once the normal water depth is reached) was originally envisioned as a cut-stone spillway that would be attractive both visually with the stone and through the cascading effect of the water passing over it. The stone spillway was replaced with a piped structure beneath the dam, because the piped structure was found to be slightly less expensive, but no less effective.
2. Auxiliary stone walls. Stone blocks were added along the cart path and a stone wall was added along the east side of the Hole 5 green. The stones along the cart path provide an aesthetically pleasing, yet functional, alternative to guard rail along the golf cart path. The stone wall was added along the edge of the green in order to provide a flatter area

adjacent to the green that will facilitate mowing and will provide some relief to golfers whose shots land on the lake side of the green but still run down the hill to the lake.

Additional guidance and approvals have been sought during the spring and summer of 2014. Highlights of these reviews include:

- The Department of Recreation has reviewed and commented on the plans, particularly regarding the proposed landscaping and the desire to revise the grading around the Hole 5 green.
- A joint-committee meeting was held on June 11, to which members of the Finance Committee, Horticulture, Environment, and Beautification (HEB) Committee, Parks and Recreation Committee, and Stormwater Committee were invited. Staff provided a summary of the project and answered questions from the committees.
- The HEB Committee reviewed and approved the landscaping proposal at its meeting on July 23. The HEB's suggestion to move the area of buffalo grass to the south side of the dam will be incorporated into the final plans.

The current plans for the project are considered to be at "final design" and are nearing approval for construction. These plans provide a viable solution to the dam, channel, and pond siltation issues that incorporates the guidance provided by the City and closely reflects the concept plan presented and approved in the fall of 2013.

Regulatory reviews and permitting

The plans have been reviewed and permitted by the Army Corps of Engineers and the Missouri Department of Natural Resources. The Metropolitan St. Louis Sewer District (MSD) has recently provided comments for the final design submission, in which MSD generally approves of the plan, with the following conditions:

1. The City will need to grant MSD a permanent drainage easement for the existing 90" diameter storm drain that begins just south of the dam. It appears that this easement should have been sought at the time that the rest of the pipe (which runs beneath the Runnymede subdivision) was installed, but no easements can be found for this pipe once it enters the golf course property. Considering the relatively short reach of pipe on the golf course property, the headwall required for it (see item #2 below), and the recently constructed access gate and road to the area, City staff anticipates that granting this easement to MSD will cause little disturbance (if any) for the golf course in the foreseeable future.
2. MSD recently confirmed that a new concrete headwall will be required at the end of the existing 90" diameter storm drain. Previous reviews from MSD had not mentioned such a wall, and the design proceeded accordingly. Such a wall can be added to the project with minimal changes to the other walls planned nearby, but it will require about four to six weeks to design the new wall, resubmit to MSD for approval, and obtain MSD approval. If approved by October, staff does not anticipate that this additional design and approval time will impact plans to repair the dam during the winter of 2014-2015.
3. The City will need to enter into an agreement with MSD that states that the City will construct the dam and related facilities according to the permitted plans and that the City will appropriately maintain the dam, lake, and channel. These facilities are typically well maintained, and staff does not anticipate that this agreement will cause any additional hardship to the City.

Staff anticipates that these issues will be addressed during August and September 2014, and that the project will receive MSD's approval by the end of September 2014. With MSD approval, the project will be ready for the bidding process to begin.

Schedule for repairs

The initial schedule for the project sought to complete the work during the winter of 2013-2014. This proved to be too ambitious, as the initial review from MSD was not completed until February 2014, and staff was wary about proceeding to construction without permits and during the spring rainy season.

Additional temporary repairs was made in March, with the plan to monitor the performance of these repairs and to supplement these as necessary with additional repairs or to proceed to construction of the entire project should a more catastrophic failure occur. The temporary repairs have proven to be rather successful, and staff is comfortable with the current plan to make permanent repairs during the winter of 2014-2015.

Recommendation

Staff understands the need to have a plan for the future repairs and improvements, and a conceptual plan of the scope of the improvements needed for the stormwater system will be available for review and discussion at the work session. Preliminary cost estimates for the envisioned improvements to the stormwater system are attached.

City staff is aware that there are competing schools of thought regarding when the project to repair the dam and remove silt from the lake should occur. One of the essential differences between the two ideas is whether or not the dam repair should proceed prior to the design and/or implementation of improvements for the entire stormwater system at the golf course. Considering this discussion, staff makes the following recommendation for each possibility, with the first option being the preferred one:

1. Pursue the dam and lake rehabilitation in the winter of 2014-2015 as planned, but consider this repair to be "phase 1" of a larger project to improve the entire system. Staff feels that completing the dam and lake repairs now will not necessarily limit future options, and that the repairs made to the dam and lake are not necessarily jeopardized by the fact that repairs to the upper ponds have not yet been made. However, staff does recommend that the development of plans for the improvement of the entire system begin as soon as possible and preferably concurrently with the repairs to the dam. If the design for the remainder of the system is pursued immediately, then these improvements could be underway as soon as the winter of 2015-2016.

Advantages:

- The dam and south lake are completed as soon as possible, limiting the aesthetic (and odorous) impact to the golf course.
- Regular monitoring and maintenance of the dam is practically eliminated.

Disadvantages:

- Risk of delayed projects to the north section of the system, resulting in re-siltation of the south lake.
- The first phase of the project is underway or complete before the full cost of all improvements is known.

2. Shift the current design effort to consider the entire stormwater system at the golf course and plan repairs for the near future. This plan would provide the best overall design for the course and would allow the City more flexibility in the staging of the project.

Presumably, this scenario would allow for all of the improvements to the golf course stormwater system to be made as soon as the winter of 2015-2016. However, the City would need to be prepared to act upon the larger scope of repairs or be prepared to repeat some design costs to seek permits when the permits expire. Continued lesser repairs to the dam would also need to be considered, as would the condition of the south lake and how that impacts the golf course.

- Advantages:
- An overall and detailed plan for the golf course could be developed and vetted, providing the best opportunity for a cohesive design.
 - The entire scope of work is known prior to the beginning of work.
 - Construction impacts the course for only one winter, if all improvements are pursued at once.

- Disadvantages:
- The current condition of the dam and south lake persists for at least another year.

Regardless of which option or strategy is chosen, staff recommends the pursuit of improvements to the entire stormwater system at the golf course in the near future and in relatively quick succession. Staff does not recommend completing the designed scope of work now (i.e. the dam and lake improvements shown on the plans), and then waiting five or ten years to pursue the rest of the improvements. Such time between projects would allow for some siltation of the southern pond and could reduce the effectiveness of the efforts of the initial project.

- Attachments:
- Project design plans for Creve Coeur Dam and Channel, dated July 28, 2014.
 - “Creve Coeur Golf Course Dam Repair,” dated July 7, 2014, from Robert Kent, Ward 4 Council Member.
 - Staff response to key issues from Mr. Kent’s comments.
 - Staff report from October 2013 Council work session.
 - Concept master plan and cost estimate for stormwater improvements at the golf course.

CREVE COEUR DAM AND CHANNEL

CREVE COEUR, MISSOURI

11400 Olde Cabin Road
Creve Coeur MO 63141

PROJECT TEAM
OWNER:



CITY OF CREVE COEUR
300 N. New Ballas Road
Creve Coeur, Missouri 63141
(314) 432-6000

CIVIL ENGINEER:



INTUITION & LOGIC
16253 Swingley Ridge Road-Suite 100
St. Louis, MO 63017
(636) 777-3000
License No. 2000152987

SURVEYOR:



SABUR, INC.
1751 Ashby Road
St. Louis, Missouri 63114
(314) 428-1414

LANDSCAPE ARCHITECT:



SWT DESIGN
1751 Ashby Road
St. Louis, Missouri 63114
(314) 428-1414

GEOTECHNICAL ENGINEER:



GEOTECHNOLOGY, INC.
11816 Lackland Road-Suite 150
St. Louis, MO 63146
314- 997-7440

INDEX

SHEET NO.	DESCRIPTION
	COVER
C-1.0	NOTES & ABBREVIATIONS
C-1.1	EASEMENTS AND ACCESS PLAN
C-1.2	DEMOLITION PLAN
C-2.0	PLAN AND PROFILE
C-3.0	DETAILS
C-3.1	LANDSCAPING DETAILS
C-4.0	WALL DETAILS
C-4.1	WALL DETAILS
C-5.0	CART PATH CENTERLINE CROSS SECTIONS INCLUDING DAM AND CHANNEL
C-5.1	PIPE CENTERLINE CROSS SECTIONS
C-6.0	EROSION AND SEDIMENT CONTROL PLAN
C-6.1	EROSION AND SEDIMENT CONTROL DETAILS
C-6.2	EROSION AND SEDIMENT CONTROL DETAILS
C-7.0	PLANTING PLAN
C-7.1	PLANTING DETAILS
C-8.0	DRAINAGE AREA MAP

GENERAL NOTE:

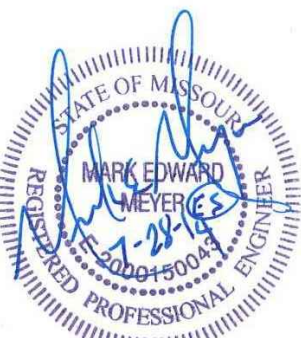
STORMWATER MANAGEMENT NOTES:
LAND AREA DISTURBED = 0.9 ACRES
ANY FUTURE LAND DISTURBANCE AND/OR INCREASE IN IMPERVIOUS AREA ON THIS SITE MAY REQUIRE ADDITIONAL STORM WATER MANAGEMENT PER MSD REGULATIONS IN PLACE AT THAT TIME

PRIOR TO OBTAINING A CONSTRUCTION PERMIT FROM THE METROPOLITAN ST. LOUIS SEWER DISTRICT, THE CONTRACTOR SHALL BE REQUIRED TO PROVIDE THE DISTRICT WITH A COPY OF AN EXECUTED CERTIFICATE OF INSURANCE INDICATING THAT THE PERMITTEE HAS OBTAINED AND WILL CONTINUE TO CARRY COMMERCIAL GENERAL LIABILITY AND COMPREHENSIVE AUTO LIABILITY INSURANCE. THE REQUIREMENTS AND LIMITS SHALL BE AS STATED IN THE "RULES AND REGULATIONS AND ENGINEERING DESIGN REQUIREMENTS FOR SANITARY AND STORMWATER DRAINAGE FACILITY", SECTION 10.090 (ADDENDUM).

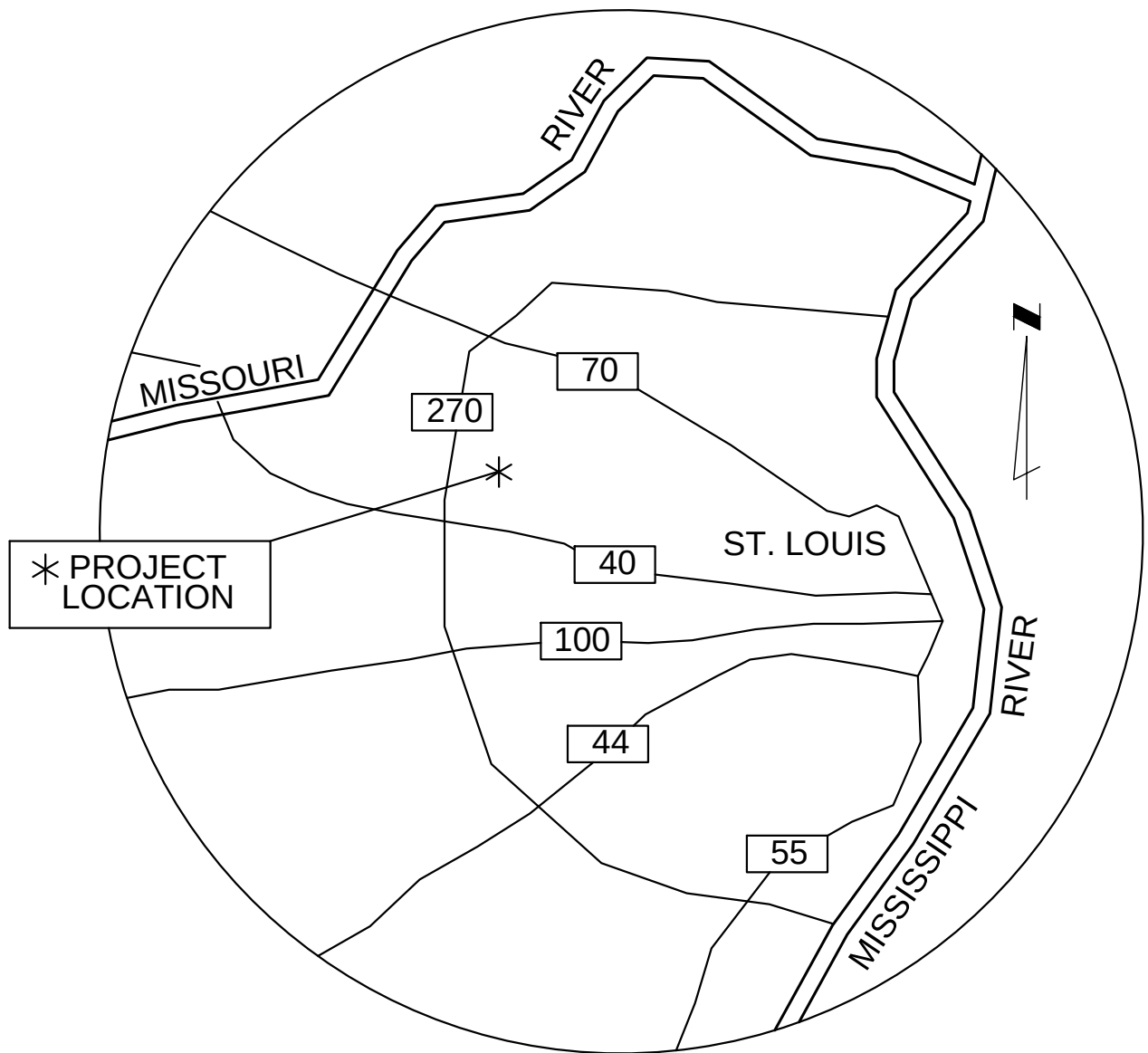
MSD P# - P-29963-00, BASEMAP 17N4

PRELIMINARY

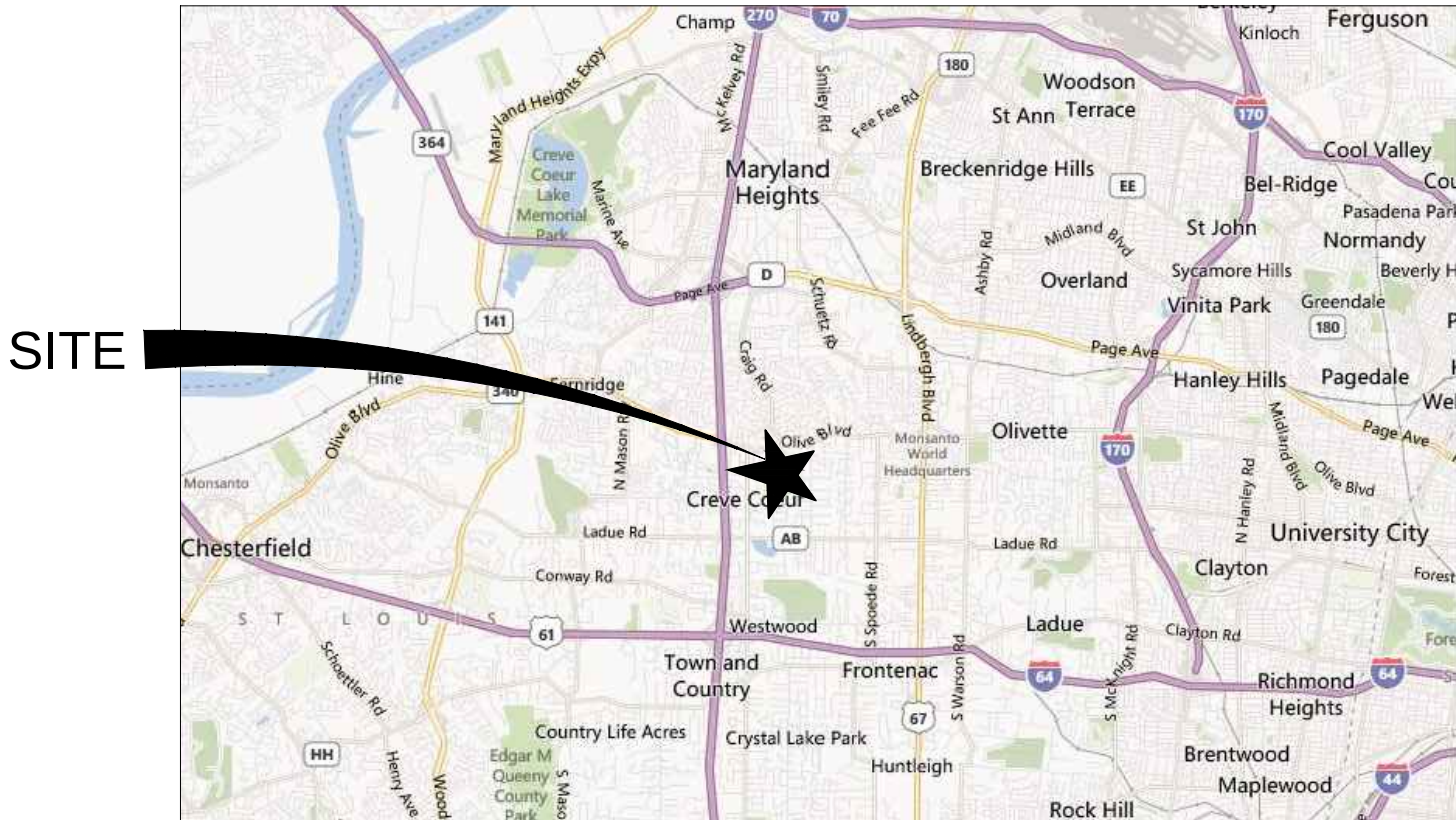
Professional Engineer Seal
Mark Edward Meyer, P.E. - Engineer



Expiration Date: Dec. 31, 2014



VICINITY MAP
NOT TO SCALE



LOCATION MAP
NOT TO SCALE

BENCHMARK:

PROJECT BENCHMARK 01:
RAILROAD SPIKE SET IN A 36" DIAMETER TREE LOCATED APPROXIMATELY 5.5 FEET NORTH OF A 72" CHAIN LINK FENCE BUILT ALONG THE SOUTHERN PROPERTY LINE OF "CREVE COEUR GOLF COURSE"; ALSO LOCATED APPROXIMATELY 225 FEET WEST OF THE INTERSECTION OF THE CENTERLINE OF MARFORD DRIVE AND THE SOUTHERN PROPERTY LINE OF "CREVE COEUR GOLF COURSE". ELEV.=594.91.

CONSTRUCTION & GRADING NOTES

1. THE CONTRACTOR IS RESPONSIBLE FOR HAVING A SET OF "APPROVED" ENGINEERING PLANS WITH THE LATEST REVISION DATE ON THE JOB SITE PRIOR TO THE START OF CONSTRUCTION. AN APPROVED SET OF PLANS WILL NEED TO BE ON SITE DURING THE PROJECT AS WELL.

2. ANY DEVIATION FROM THESE DESIGN PLANS MAY CAUSE THE WORK TO BE UNACCEPTABLE.

3. ANY UNANTICIPATED CONDITIONS ENCOUNTERED DURING THE CONSTRUCTION PROCESS SHALL BE IDENTIFIED IN WRITING TO THE OWNER/ENGINEER IMMEDIATELY.

4. THE STREETS SURROUNDING THESE PROJECT SITES AND ANY STREET USED FOR CONSTRUCTION ACCESS THERETO SHALL BE KEPT FREE FROM MUD AND CONSTRUCTION DEBRIS AND SHALL BE CLEANED THROUGHOUT THE DAY. ALL AFFECTED STREETS WILL NEED TO BE "BROOM CLEANED" BY THE END OF EACH DAY.

5. ALL TRASH AND DEBRIS ON SITE, EITHER EXISTING OR FROM CONSTRUCTION, MUST BE REMOVED AND PROPERLY DISPOSED OF OFF SITE.

6. NO EXCAVATION SHALL BE MADE SO CLOSE TO THE PROPERTY LINE AS TO ENDANGER ANY ADJOINING PROPERTY OR ANY PUBLIC OR PRIVATE STREET WITHOUT SUPPORTING AND PROTECTING SUCH PUBLIC OR PRIVATE STREET OR PROPERTY FROM SETTLING, CRACKING, OR OTHER DAMAGE.

7. ALL GRADING SHALL BE WITHIN 0.1 FEET, PLUS OR MINUS, OF THOSE SHOWN ON THE PLAN. GRADING TO BE REVIEWED AND APPROVED BY OWNERS REPRESENTATIVE. STRUCTURE GRADES SHALL BE PER PROJECT SPECIFICATIONS

8. CONTRACTOR IS RESPONSIBLE FOR MONITORING GRADING OPERATION AND ACCURACY OF "FINAL ROUGH" GRADES. CONTACT ENGINEER OF ANY DISCREPANCIES AFFECTING FINAL GRADING BALANCE.

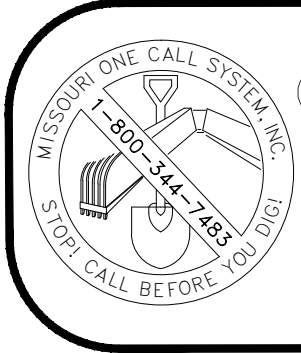
9. SITE CONDITIONS MAY HAVE CHANGED SINCE THE SURVEY WAS PREPARED. CONTRACTOR SHALL VISIT SITE TO FAMILIARIZE THEMSELVES WITH THE CURRENT CONDITIONS.

10. ALL PROJECT COORDINATES AND ELEVATIONS ARE BASED ON PROJECT BENCHMARKS AS LISTED BELOW.

PROJECT BENCHMARK 01:
RAILROAD SPIKE SET IN A 36" DIAMETER TREE LOCATED APPROXIMATELY 5.5 FEET NORTH OF A 72" CHAIN LINK FENCE BUILT ALONG THE SOUTHERN PROPERTY LINE OF "CREVE COEUR GOLF COURSE"; ALSO LOCATED APPROXIMATELY 225 FEET WEST OF THE INTERSECTION OF THE CENTERLINE OF MARFORD DRIVE AND THE SOUTHERN PROPERTY LINE OF "CREVE COEUR GOLF COURSE".
ELEV.=594.91.

11. ALL EXISTING TOPOGRAPHY, UNDERGROUND UTILITIES, STRUCTURES AND ASSOCIATED FACILITIES SHOWN ON THESE DRAWINGS HAVE BEEN PLOTTED FROM AVAILABLE SURVEYS AND RECORDS. THEREFORE, THEIR LOCATIONS AND ELEVATIONS MUST BE CONSIDERED APPROXIMATE ONLY. THERE MAY BE OTHER FACILITIES, THE EXISTENCE OF WHICH ARE NOT PRESENTLY KNOWN.

12. CONTRACTOR IS TO VERIFY ALL EXISTING STRUCTURES AND FACILITIES AND NOTIFY ENGINEER OF ANY DISCREPANCIES PRIOR TO ORDERING MATERIAL AND STARTING WORK.



Call BEFORE you DIG

TOLL FREE

1-800-DIG-RITE

MISSOURI ONE-CALL SYSTEM, INC.

13. THE GENERAL CONTRACTOR SHALL COORDINATE WITH UTILITY COMPANIES TO PROVIDE CABLE TV, PHONE, ELECTRIC, GAS, WATER AND IRRIGATION SERVICES. GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR SECURING SITE LAYOUTS FOR THESE UTILITIES AND SHALL COORDINATE AND PROVIDE CONDUIT CROSSINGS AS REQUIRED. THIS COORDINATION SHALL BE CONSIDERED INCIDENTAL TO GENERAL CONTRACTOR WITH OWNER. ANY CONFLICTS IN UTILITIES SHALL BE CORRECTED BY THE GENERAL CONTRACTOR AT NO ADDITIONAL COST TO OWNER.

14. BEFORE EXCAVATING OVER OR ADJACENT TO ANY EXISTING UTILITIES, CONTRACTOR SHALL NOTIFY THE OWNER OF SUCH UTILITIES TO ENSURE THAT PROTECTIVE WORK WILL BE COORDINATED AND PERFORMED BY THE CONTRACTOR IN ACCORDANCE WITH THE REQUIREMENTS OF THE OWNER OF THE UTILITY INVOLVED. IF ANY EXISTING SERVICE LINES, UTILITIES AND UTILITY STRUCTURES WHICH ARE TO REMAIN IN SERVICE ARE UNCOVERED OR ENCOUNTERED DURING THIS OPERATION, THEY SHALL BE SAFEGUARDED, PROTECTED FROM DAMAGE AND SUPPORTED IF NECESSARY.

15. CONTRACTOR SHALL COORDINATE WITH PROPERTY OWNERS REGARDING PRIVATE UTILITIES ON THE PREMESIS, INCLUDING BUT NOT LIMITED TO IRRIGATION SYSTEM AND LIGHTING FACILITIES.

16. CONTRACTOR SHALL NOT REMOVE ANY TREE OR FENCE, UNLESS MARKED FOR REMOVAL ON THE PLANS, WITHOUT PRIOR APPROVAL.

17. ALL APPLICABLE PROVISIONS OF THE CURRENT OCCUPATIONAL SAFETY AND HEALTH ACT ARE HEREIN INCORPORATED BY REFERENCE.

18. THE CONTRACTOR, BY USING THESE PLANS FOR THEIR WORK, AGREES TO HOLD HARMLESS ILINC ENGINEERING, INC. THE CITY OF CREVE COEUR, MISSOURI, THEIR EMPLOYEES AND AGENTS AND THE OWNER WHILE ACTING WITHIN THE SCOPE OF THEIR DUTIES FROM AND AGAINST ANY AND ALL LIABILITY, CLAIMS, DAMAGES, AND THE COST OF DEFENSE ARISING OUT OF CONTRACTOR(S) PERFORMANCE OF THE WORK DESCRIBED HEREIN, BUT NOT INCLUDING THE SOLE NEGLIGENCE OF THE OWNER, HIS AGENTS, THE ENGINEER, HIS EMPLOYEES AND AGENTS. THE CONTRACTOR'S LIABILITY IS FURTHER DEFINED IN THE CITY-CONTRACTOR AGREEMENT.

19. ALL "CLEARING AND GRUBBING" SHALL INCLUDE CLEARING OF TREES, STUMPS, BRUSH, FENCES, POSTS, MAILBOXES AND OTHER EXISTING SURFACE FEATURES AS NECESSARY BY THE CONTRACTOR TO PERFORM THE WORK SHOWN ON THE PLANS.

20. THE CONTRACTOR SHALL PROVIDE FOR THE SAFE AND ORDERLY PASSAGE OF TRAFFIC AND PEDESTRIANS WHERE HIS/HER OPERATIONS ABUT PUBLIC THOROUGHFARES AND ADJACENT PROPERTY IN ACCORDANCE WITH LOCAL ORDINANCE AND TO THE SATISFACTION OF THE DIRECTOR OF PUBLIC WORKS FOR THE CITY OF CREVE COEUR.

21. AREAS OUTSIDE THE R.O.W. LINE OR CONSTRUCTION LIMIT LINE IMPACTED BY OPERATIONS OF THE CONTRACTOR SHALL BE RETURNED TO THE STATE IT WAS FOUND PRIOR TO NEW CONSTRUCTION, EXCEPT WHERE NEW WORK IS SHOWN.

22. STREET PAVING AND CURBS TO REMAIN SHALL BE PROTECTED FROM DAMAGE AND IF DAMAGED, SHALL BE REPLACED PROMPTLY TO THE SATISFACTION OF THE DIRECTOR OF PUBLIC WORKS FOR THE CITY OF CREVE COEUR.

23. ANY DAMAGE TO EXISTING UTILITIES SHALL BE REPAIRED BY THE UTILITY COMPANY AT THE CONTRACTOR'S EXPENSE.

24. ALL EXISTING PAVEMENT OR CONCRETE TO BE REMOVED SHALL BE SAWCUT ALONG LIMITS OF PROPOSED REMOVAL BEFORE COMMENCEMENT OF PAVEMENT REMOVAL.

25. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL REQUIRED PERMITS BEFORE CONSTRUCTION BEGINS ALONG OR ACROSS EXISTING STREETS OR HIGHWAYS. CONTRACTOR SHALL MAKE ARRANGEMENTS FOR THE PROPER BRACING, SHORING AND OTHER REQUIRED PROTECTION OF ALL ROADWAYS BEFORE CONSTRUCTION BEGINS AND SHALL BE RESPONSIBLE FOR ANY DAMAGE TO THE STREETS OR ROADWAYS AND ASSOCIATED STRUCTURES AND SHALL MAKE REPAIRS AS NECESSARY TO THE SATISFACTION OF THE OWNER OF THE ROADWAY.

26. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE INSTALLATION AND MAINTENANCE OF ADEQUATE SIGNS, TRAFFIC CONTROL DEVICES AND WARNING DEVICES TO INFORM AND PROTECT THE PUBLIC DURING ALL PHASES OF CONSTRUCTION. BARRICADES AND WARNING SIGNS SHALL BE PROVIDED IN ACCORDANCE WITH ST. LOUIS COUNTY STANDARD SPECIFICATIONS. ALL TRAFFIC CONTROL WORK SHALL BE DONE IN ACCORDANCE WITH MUTCD AND CREVE COEUR.

27. 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 SOLELY RESPONSIBLE FOR EXECUTION OF HIS/HER WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS AND SPECIFICATIONS.

28. MAINTENANCE OF THE SEWERS DESIGNATED "PUBLIC" SHALL BE THE RESPONSIBILITY OF THE METROPOLITAN ST. LOUIS SEWER DISTRICT UPON DEDICATION OF THE SEWERS TO THE DISTRICT.

29. ALL FILLED AREAS, INCLUDING TRENCH BACKFILLS, UNDER BUILDINGS, PROPOSED STORM AND SANITARY SEWER LINES, AND PAVED AREAS SHALL BE COMPACTED TO A MINIMUM OF 90 PERCENT OF "MODIFIED PROCTOR". FILL IS TO BE PLACED IN A MAXIMUM OF 9-INCH LIFTS. TESTS SHALL BE TAKEN AT A MAXIMUM OF 50-FOOT INTERVALS ALONG THE ROUTE OF THE PIPE; AT A MAXIMUM OF 2-FOOT VERTICALLY; AND Laterally ON EACH SIDE OF THE PIPE, AT A DISCHARGE EQUAL TO THE DEPTH OF FILL OVER THE PIPE. A COPY OF THESE RESULTS WILL BE SUBMITTED TO MSD PRIOR TO CONSTRUCTION APPROVAL.

30. ANY ABANDONED SEWERS SHALL BE REMOVED OR COMPLETELY GROUT FILLED.

31. NOTE - PIPE JOINTS WITH ADAPTERS AND COUPLINGS SHALL BE SUPPLIED AND INSTALLED WITH 316 STAINLESS STEEL NUT AND BOLT CLAMPS (T-BOLT) CONFIGURATION; AND WITH STAINLESS STEEL SHEAR BANDS, BEING A MINIMUM OF TWELVE (12) MILS (MSD STD. CONST SPECS. PT. 2, SUBSECTION H 11). WORM DRIVE HOSE CLAMPS AND CONCRETE BACKFILLING (CAUSTICITY) WILL NO LONGER BE ALLOWED AT THOSE JOINTS. GRANULAR BACKFILL SHOULD BE USED. IF FLOWABLE FILL IS REQUIRED, THE CONTRACTOR SHALL WRAP AND TAPE THE ADAPTERS AND COUPLINGS WITH A SIX (6) MIL POLYETHYLENE SHEET.

32. TRENCH BACKFILL COMPACTION AND TESTING REQUIREMENTS: THE CONTRACTOR IS TO REFER TO PART 4, SECTION H OF THE METROPOLITAN ST. LOUIS SERE DISTRICT, STANDARD CONSTRUCTION SPECIFICATIONS FOR SEWERS AND DRAINAGE FACILITIES, 2009 EDITION, TO ESTABLISH THE REQUIREMENTS FOR THE SPECIFIC TYPE OF BACKFILL BEING USED.

STANDARD CONSTRUCTION:

ALL STORM AND SANITARY SEWER STRUCTURES AND APPURTENANCES TO BE DEDICATED TO MSD, OR TO BE PRIVATE UNDER MSD INSPECTION, SHALL CONFORM TO THE METROPOLITAN ST. LOUIS SEWER DISTRICT, STANDARD CONSTRUCTION SPECIFICATIONS FOR SEWER AND DRAINAGE FACILITIES, 2009. THAT WILL INCLUDE STANDARD DETAILS SHOWN THEREIN, AND SHALL INCLUDE ALL SUBSEQUENT CHANGES MADE THERETO.

PART 4 - PIPE SEWER CONSTRUCTION
SECTION B, PIPE FIELD TESTS, PARAGRAPH 2, REACH INTEGRITY TESTING - DELETE THE FIRST SENTENCE AND THE FOLLOWING REPLACEMENT APPLIES:
ALL SANITARY AND COMBINED SEWERS SHALL SUSTAIN A MAXIMUM LEAKAGE LIMIT OF 100 GALLONS/INCH OF PIPE DIAMETER/MILE OF LINE/DAY, AS REQUIRED BY THE MISSOURI DEPARTMENT OF NATURAL RESOURCES SPECIFICATIONS.

SECTION B, PIPE FIELD TESTS, PARAGRAPH 2, REACH INTEGRITY TESTING, SUBPARAGRAPH C, INFILTRATION/EXFILTRATION TESTING - DELETE THE SIXTH SENTENCE, CONCERNING LEAKAGE LIMITS, AND THE FOLLOWING REPLACEMENT APPLIES:
THE MEASUREMENT OF LEAKAGE SHALL NOT EXCEED 100 GALLONS/INCH OF PIPE DIAMETER/MILE OF LINE/DAY, AS REQUIRED BY THE MISSOURI DEPARTMENT OF NATURAL RESOURCES SPECIFICATIONS.

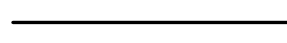
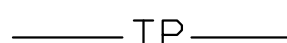
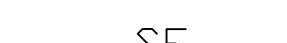
SECTION B, PIPE FIELD TESTS, PARAGRAPH 4, MANHOLE TESTING, SUBPARAGRAPH A, VACUUM TESTING - AFTER THE FIRST SENTENCE, THE FOLLOWING ADDITION APPLIES:
THE VACUUM TEST MUST BE PERFORMED PRIOR TO BACKFILLING AROUND THE MANHOLE UNLESS THE CONTRACTOR PROVIDES DOCUMENTATION FROM THE PRECAST MANHOLE MANUFACTURER STATING THAT THE MANHOLE MAY BE VACUUM TESTED AFTER BACKFILLING HAS TAKEN PLACE. THE CONTRACTOR MUST SUBMIT THIS DOCUMENTATION PRIOR TO BACKFILLING AROUND ANY MANHOLE.

SECTION B, PIPE FIELD TESTS, PARAGRAPH 4, MANHOLE TESTING, SUBPARAGRAPH B, EXFILTRATION TESTING -DELETE THE SECOND SENTENCE, CONCERNING LEAKAGE LIMITS, AND THE FOLLOWING ADDITION APPLIES:
FOR EXFILTRATION TESTING, THE ALLOWABLE LEAKAGE LIMIT IS 100 GALLONS/INCH OF PIPE DIAMETER/MILE OF LINE/DAY WHEN THE AVERAGE HEAD ON THE TEST SECTION IS THREE FEET (3') OR LESS.

EXISTING



NEW



LEGEND CONTINUED



RECORD CALCULATED

SURVEY POINTS ESTABLISHED

SURVEY MONUMENTATION FOUND

CROSS FOUND

CONCRETE MONUMENT FOUND

IRON PIPE FOUND

IRON BAR FOUND

R.O.W. MONUMENT FOUND

STONE FOUND

RAILROAD SPIKE FOUND

LARGE NAIL (TRAVERSE)

IRON BAR (TRAVERSE)

CROSS (TRAVERSE)

PK NAIL (TRAVERSE)

INDIVIDUAL OWNERSHIP PARCEL (IOP)

SUBDIVISION LOT NUMBER

GUARD RAIL

UTILITY METER OR VALVE

SPRINKLER HEAD

SPRINKLER VALVE

POWER POLE

POWER POLE & GUY

STREET SIGN

FIRE HYDRANT

LIGHT STANDARD

MAIL BOX

HOUSE VENT

TRAFFIC SIGNAL

UTILITY BOX

LOW SILL LOCATION

ABBREVIATIONS

AI

ASPH

ATG

B.M.

B&B

BMP

C

CFS

CLCW

CONC.

CPP

CR

CTV

DIP

DND

E

EGL

EL

EP

ESMT

EXIST

F

FES

FH

FO

FT

G

GC

GCI

HGL

I.D.

IN

IP

LDB

MAX

MH

MIN

O&M

OTP

P

PCB

PCR

PDE

PED

PPED

PROP

PVC

RPC

RDB

RR

SAN

SHLDR

SMH

SS

SSMH

STA

T

TBR

TBR&R

TBR&RBO

TBR&REL

TPED

TSCL

TPVED

TYP

UIP

VCP

W

YR

AREA INLET

ASPHALT

ADJUST TO GRADE

BENCH MARK

BALL & BURLAP

BEST MANAGEMENT PRACTICES

CENTER LINE

CUBIC FEET PER SECOND

COIR LOG CONTOUR WATTLING

CONCRETE

CORRUGATED PLASTIC PIPE

COMPOSITE REVETMENT

CABLE TELEVISION

DUCTILE IRON PIPE

DON NOT DISTURB

ELECTRIC

ENERGY GRADE LINE

ELEVATION

EXPOSED PIPE

EASEMENT

EXISTING

FLOW LINE

FLARED END SECTION

FIRE HYDRANT

FIBER OPTIC

FEET

GAS

GRADE CONTROL

GRADED CURB INLET

HYDRAULIC GRADE LINE

INNER DIAMETER

INCHES

IRON PIN

LEFT DESCENDING BANK

MAXIMUM

MANHOLE

MINIMUM

OPERATION AND MAINTENANCE

OPEN TOP PIPE

PROPERTY LINE

PHONE CABLE BOX

PARTIAL COMPOSITE REVETMENT

PERMANENT DRAINAGE EASEMENT

PEDESTAL

POWER PEDESTAL

PROPOSED

POLYVINYL CHLORIDE

REINFORCED CONCRETE PIPE

RIGHT DESCENDING BANK

RAILROAD

SANITARY

SHOULDER

SANITARY MANHOLE

STORM SEWER

STORM SEWER MANHOLE

STATION

TELEPHONE

TO BE REMOVED

TO BE REMOVED AND REPLACED

TO BE REMOVED AND REPLACED BY OTHERS

TO BE REMOVED AND RELOCATED

TELEPHONE PEDESTAL

TEMPORARY SLOPE CONSTRUCTION LIMIT

TELEVISION PEDESTAL

TYPICAL

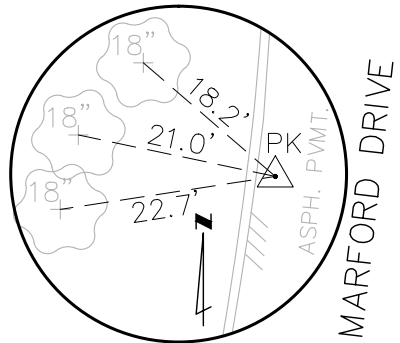
USE IN PLACE

VITRIFIED CLAY PIPE

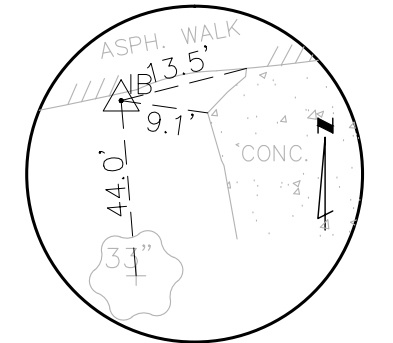
WATER

YEAR

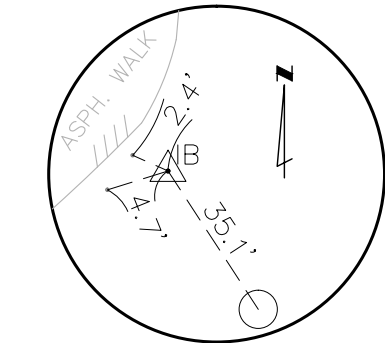
REFERENCE TIES - CREVE COEUR



REFERENCE TIE
CONTROL POINT #203
PK NAIL
N 1030126.935
E 838630.102
ELEV 603.40
NOT TO SCALE



REFERENCE TIE
CONTROL POINT #301
IRON ROD W/ CAP
N 1030291.383
E 838462.844
ELEV 595.10
NOT TO SCALE



REFERENCE TIE
CONTROL POINT #303
IRON ROD W/ CAP
N 1030462.050
E 839019.506
ELEV 602.77
NOT TO SCALE



CITY OF CREVE COEUR, MO.

1949

INTUITION LOGIC

ILINC Engineering Incorporated
MO Certificate of Authority
2000152987
16253 Swingley Ridge Rd.
Suite 100
Chesterfield, MO 63017
Phone (636) 777-3000
Fax (314) 432-5812

Creve Coeur Dam and Channel

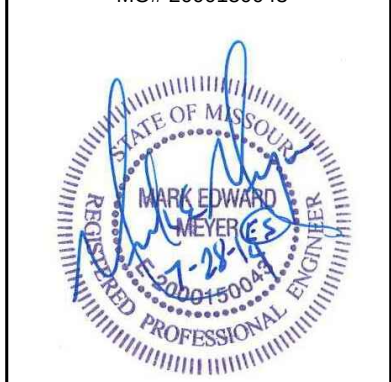
11400 Olde Cabin Road

Creve Coeur MO 63141

Creve Coeur, St Louis County, Missouri

THE PROFESSIONAL WHOSE SIGNATURE AND PERSONAL SEAL APPEAR HEREON, ASSUMES RESPONSIBILITY ONLY FOR WHAT APPEARS ON THIS PAGE, AND DISCLAIMS (PURSUANT TO SECTION 327 ALL RMO) ANY RESPONSIBILITY FOR ALL OTHER PLANS, SPECIFICATIONS, ESTIMATES, REPORTS, OR OTHER DOCUMENTS OR INSTRUMENTS NOT SEALED BY THE UNDERSIGNED PROFESSIONAL RELATING TO OR INTENDED TO BE USED FOR ANY PART OR PARTS OF THE PROJECT TO WHICH THIS PAGE REFERS.

Professional Engineer Seal
Mark Edward Meyer - Engineer
MO# 2000150043



Expiration Date: Dec. 31, 2014

Rev	Date	Description
-	-	-
-	-	-
-	-	-
-	-	-

Project No. 1311
Designed: MEM
Drawn: JDF
Checked: TPD
Approved: MEM
Sheet Title:

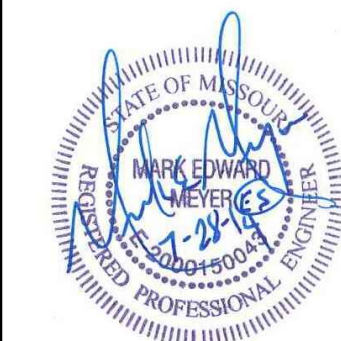
NOTES AND ABBREVIATIONS

Sheet Number:

Creve Coeur Dam and Channel
11400 Olde Cabin Road
Creve Coeur MO 63141
Creve Coeur, St Louis County, Missouri

THE PROFESSIONAL WHOSE SIGNATURE AND PERSONAL SEAL APPEAR HEREON, ASSUMES RESPONSIBILITY ONLY FOR WHAT APPEARS ON THIS PAGE, AND DISCLAIMS (PURSUANT TO SECTION 327.411 RSMO) ANY RESPONSIBILITY FOR ALL OTHER PLANS, SPECIFICATIONS, ESTIMATES, REPORTS, OR OTHER DOCUMENTS OR INSTRUMENTS NOT SEALED BY THE UNDERSIGNED PROFESSIONAL RELATING TO OR INTENDED TO BE USED FOR ANY PART OR PARTS OF THE PROJECT TO WHICH THIS PAGE REFERS.

Professional Engineer Seal
Mark Edward Meyer - Engineer
MO# 2000150043



Expiration Date: Dec. 31, 2014

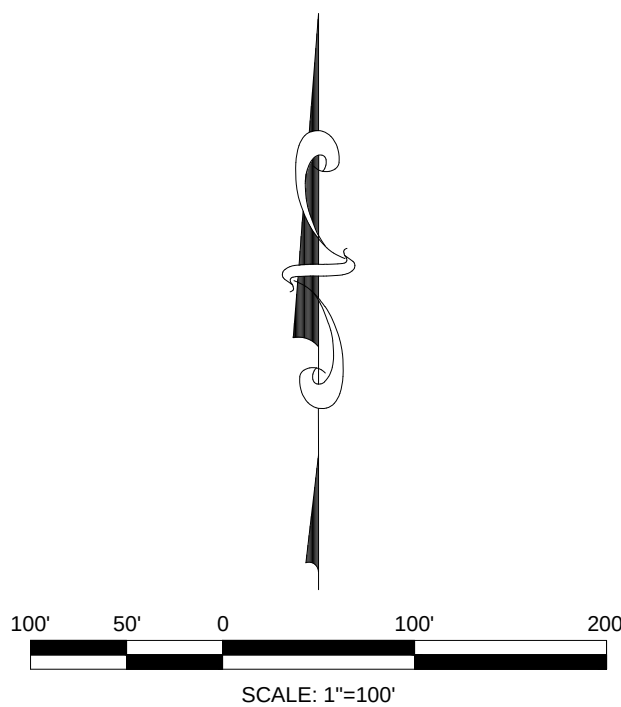
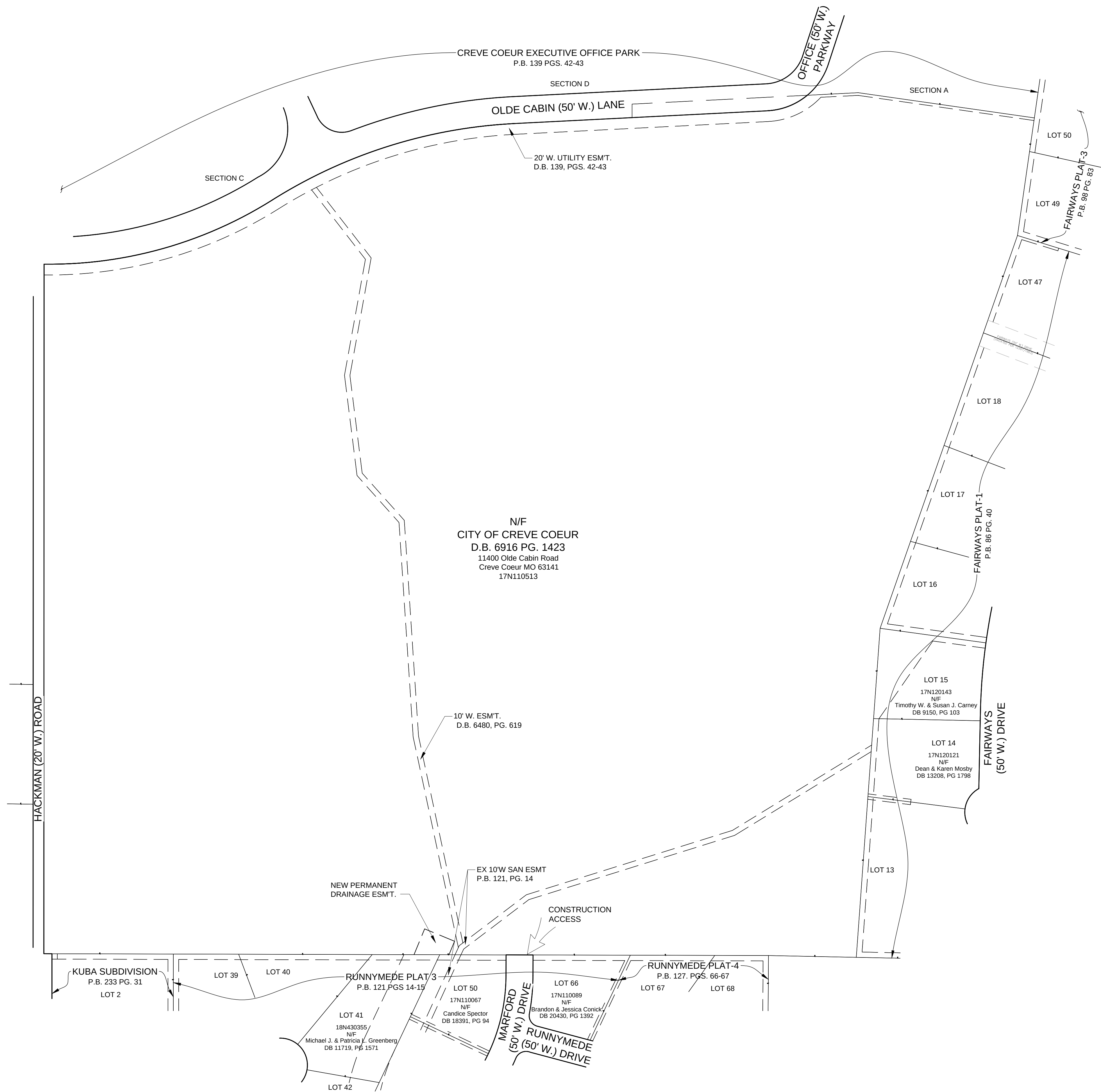
Rev	Date	Description
.	.	.
.	.	.
.	.	.
.	.	.

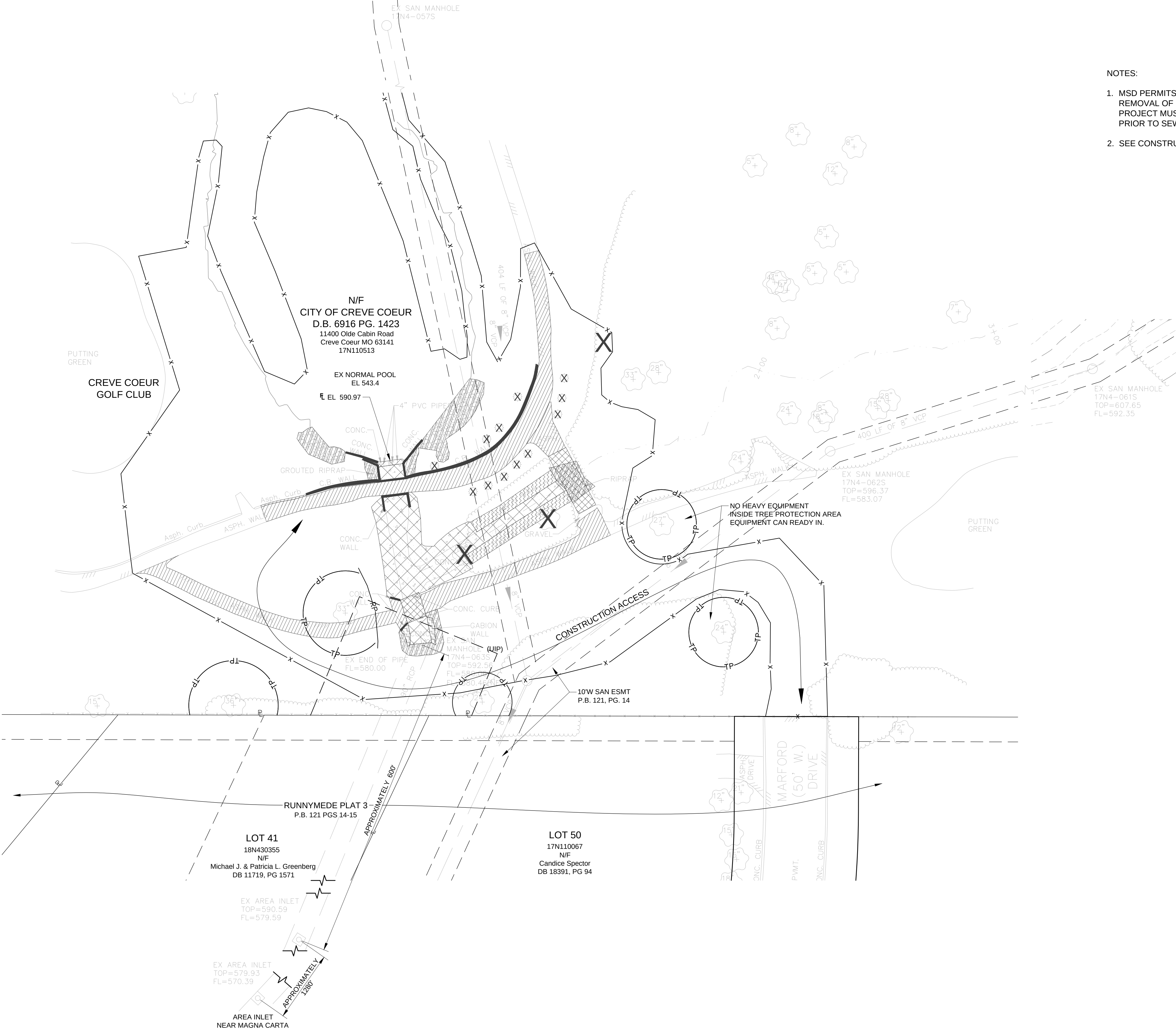
Project No. 1311
Designed: MEM
Drawn: JDF
Checked: TPD
Approved: MEM
Sheet Title:

EASEMENTS AND ACCESS PLAN

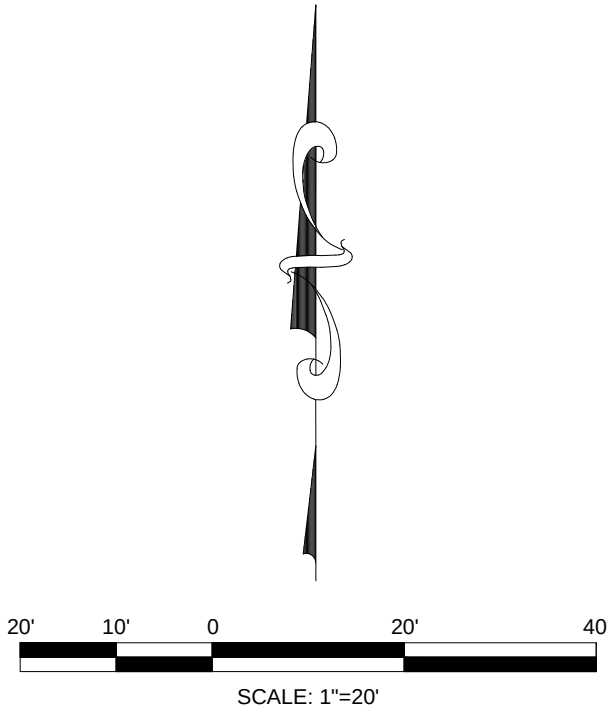
Sheet Number:

C-1.1





- NOTES:
1. MSD PERMITS ARE REQUIRED PRIOR TO THE ABANDONMENT OR REMOVAL OF EXISTING SEWERS. TO RECEIVE MSD PERMITS THE PROJECT MUST HAVE MSD PLAN APPROVAL. NOTIFY MSD 48 HOURS PRIOR TO SEWER ABANDONMENT AND/OR REMOVAL.
 2. SEE CONSTRUCTION PHASING SHEET.



LEGEND	
	ASPHALT
	BRIDGE
	CONCRETE
	GABIONS
	RIPRAP
	RETAINING WALLS
	TREE/BUSH REMOVAL

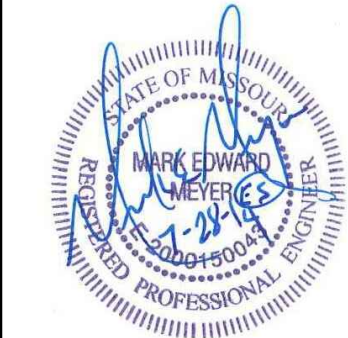


INTUITION LOGIC
ILINC Engineering Incorporated
MO Certificate of Authority
2000152987
16253 Swingley Ridge Rd.
Suite 100
Chesterfield, MO 63017
Phone (636) 777-3000
Fax (314) 432-5812

Creve Coeur Dam and Channel
11400 Olde Cabin Road
Creve Coeur MO 63141
Creve Coeur, St Louis County, Missouri

THE PROFESSIONAL WHOSE SIGNATURE AND PERSONAL SEAL APPEAR HEREON, ASSUMES RESPONSIBILITY ONLY FOR WHAT APPEARS ON THIS PAGE AND DISCLAIMS (PURSUANT TO SECTION 321 ALL RSMO) ANY RESPONSIBILITY, FOR ALL OTHER PLANS, SPECIFICATIONS, ESTIMATES, REPORTS, OR OTHER DOCUMENTS OR INSTRUMENTS NOT SEALED BY THE UNDERSIGNED PROFESSIONAL RELATING TO OR INTENDED TO BE USED FOR ANY PART OR PARTS OF THE PROJECT TO WHICH THIS PAGE REFERS.

Professional Engineer Seal
Mark Edward Meyer - Engineer
MO# 2000150043



Expiration Date: Dec. 31, 2014

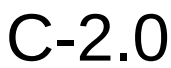
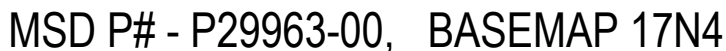
Rev	Date	Description
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-

Project No. 1311
Designed: MEM
Drawn: JDF
Checked: TPD
Approved: MEM
Sheet Title:

DEMOLITION PLAN

Sheet Number:

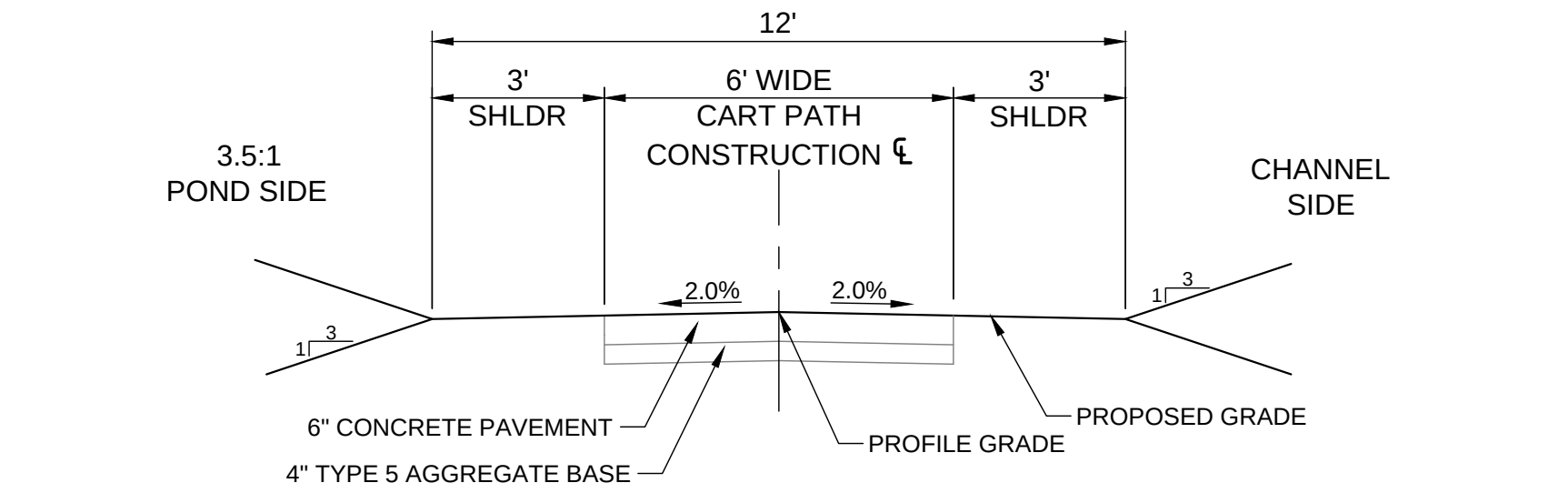
C-1.2



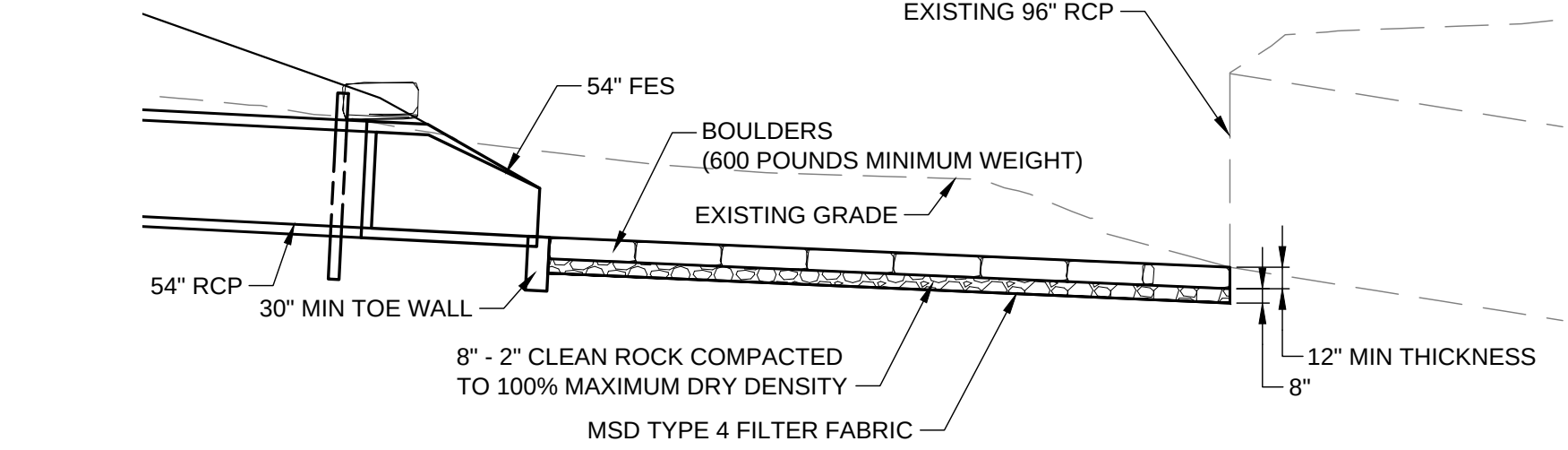
006_CREVE_COEUR_Details

Path: P:\1311 - CREVE COEUR - Dam and Channel\CAD\plans
Plotted on: 8/5/14 @ 9:39 AM by ----

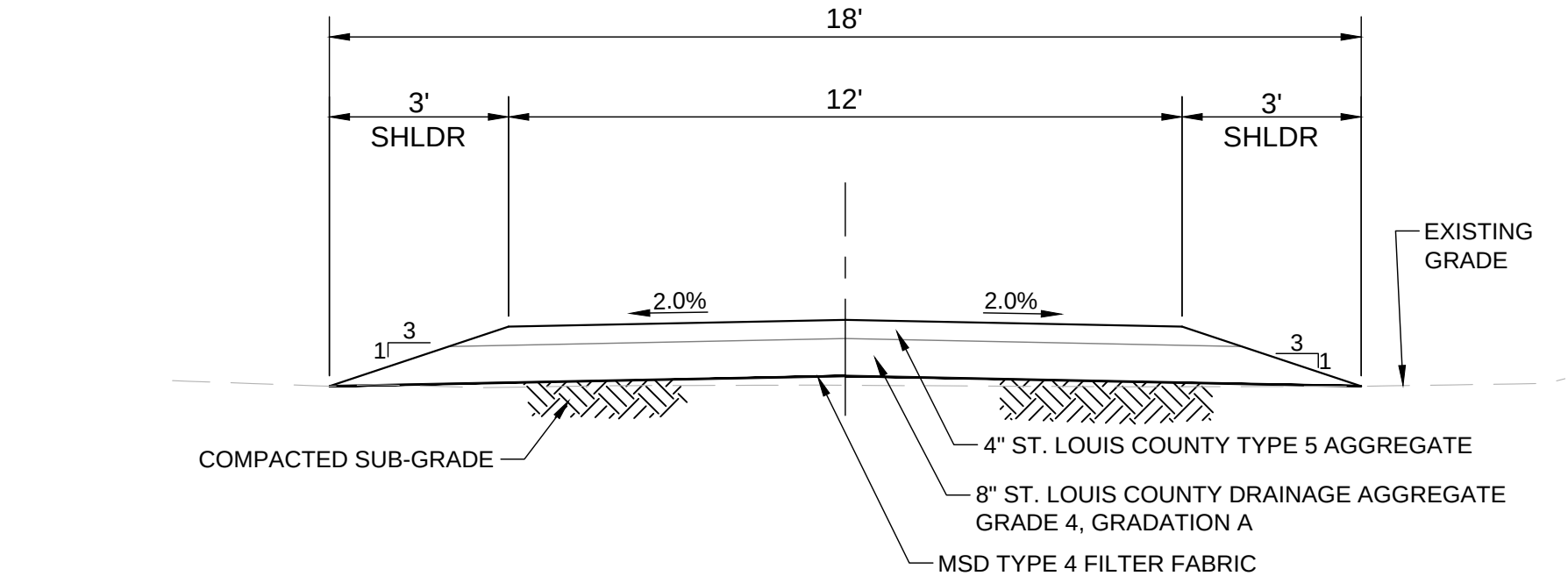
Attachment: Creve Coeur Dam and Channel Plan Set FINAL (1063 : Golf Course Dam and Channel Rehabilitation Report)



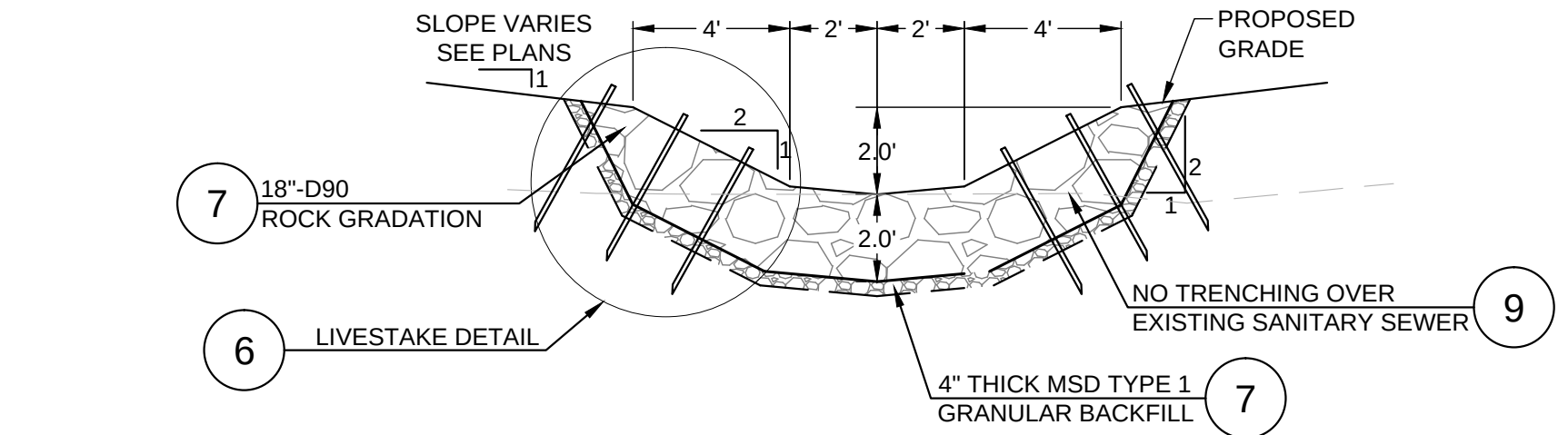
1 CART PATH NTS



2 BOULDER STILLING BASIN NTS

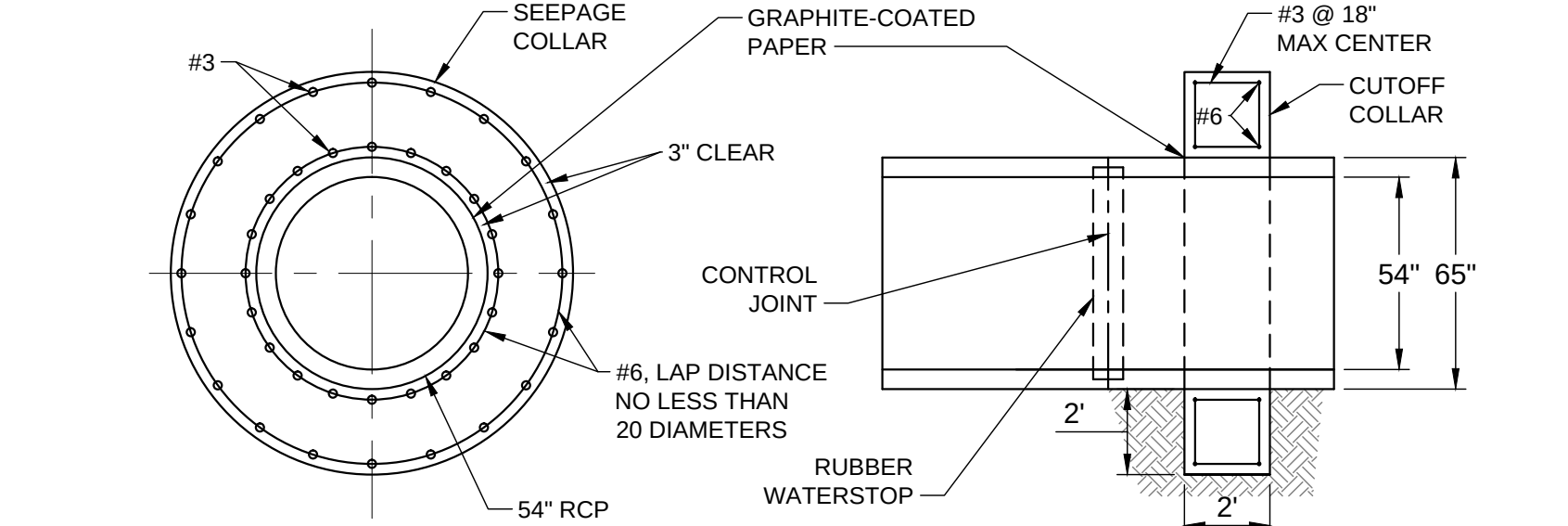


3 GRAVEL ACCESS ROAD NTS

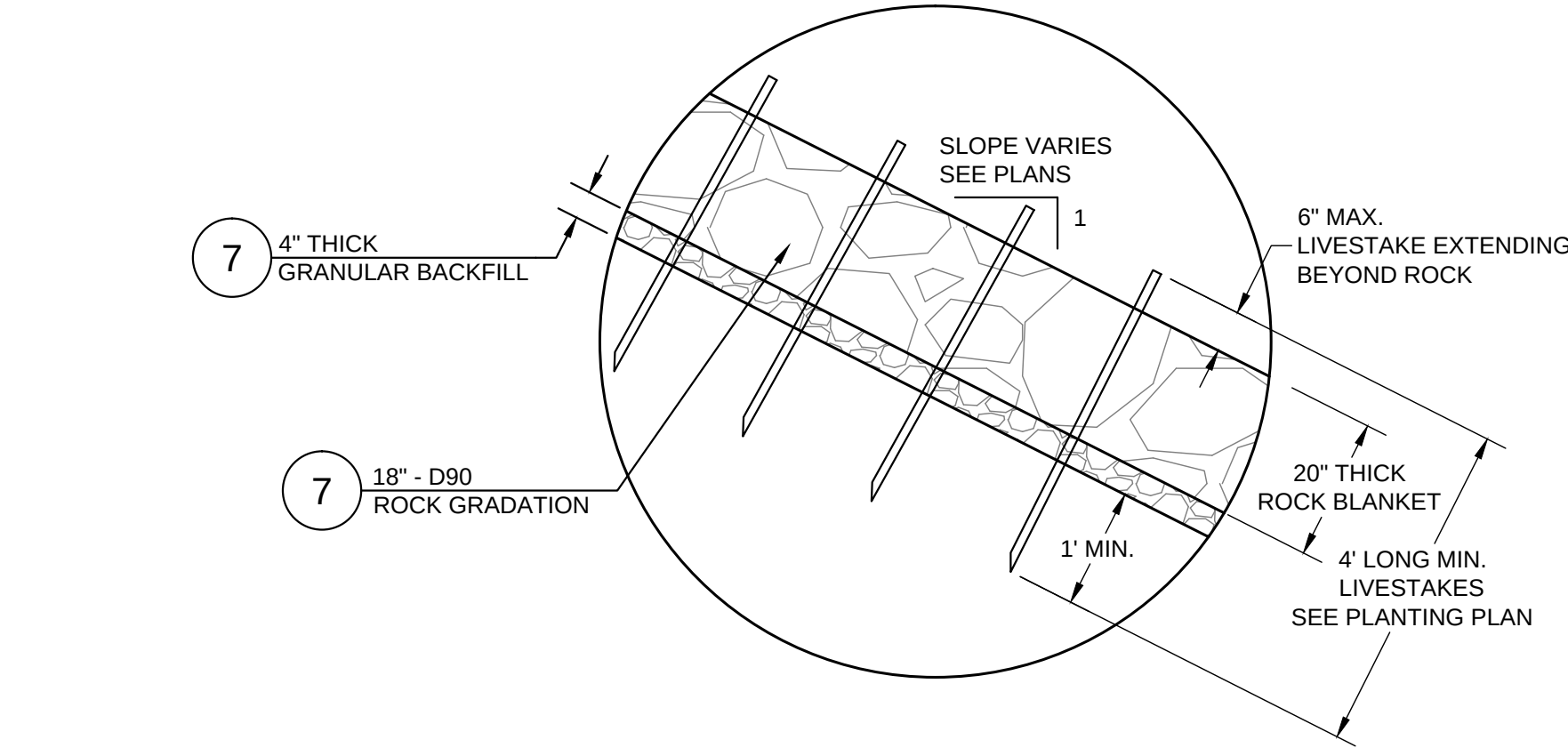


4 VEGETATED ROCK CHANNEL NTS

5 NTS



8 SEEPAGE COLLAR DETAIL NTS



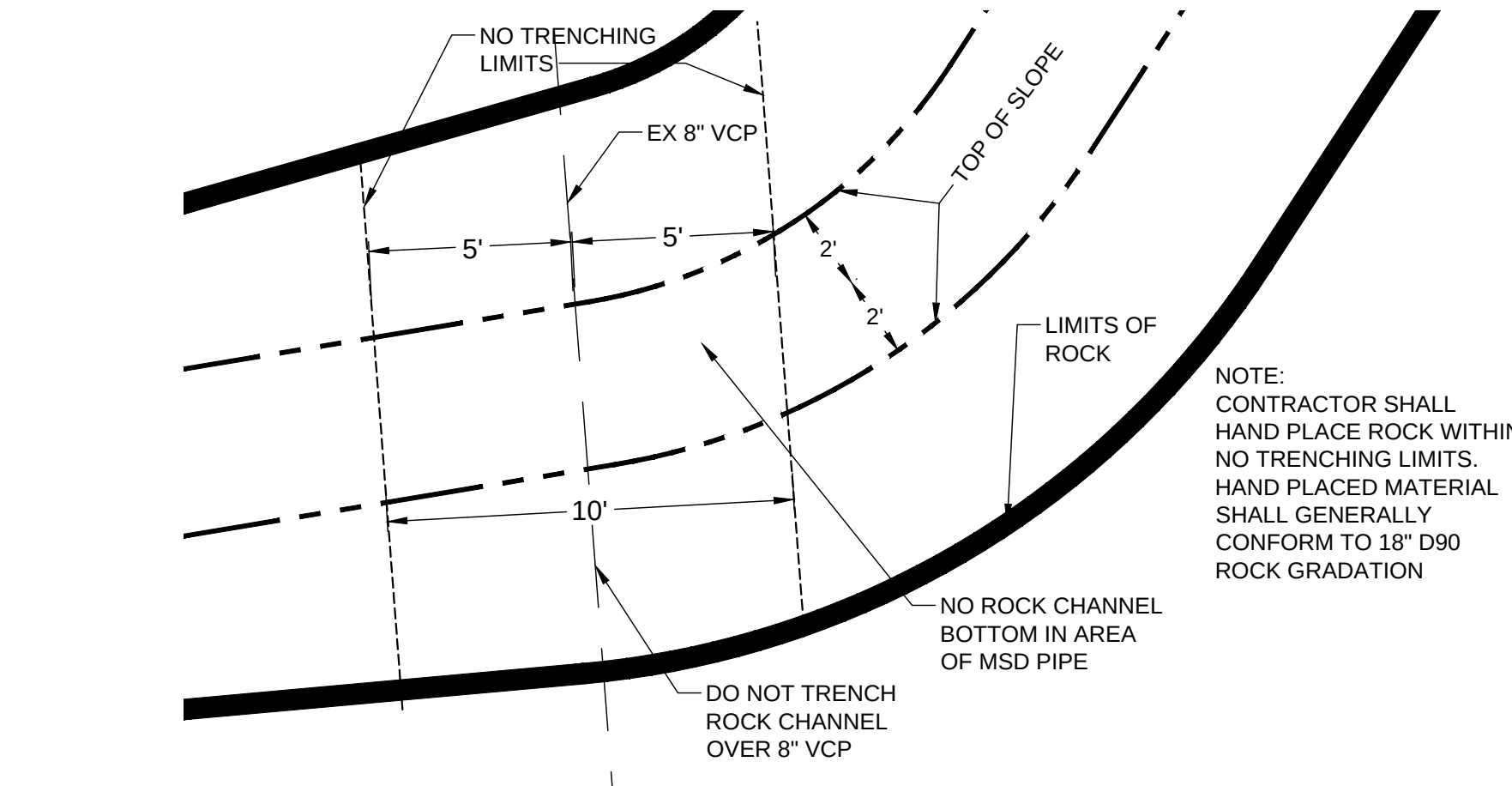
6 LIVESTAKE DETAIL NTS

NOTES:

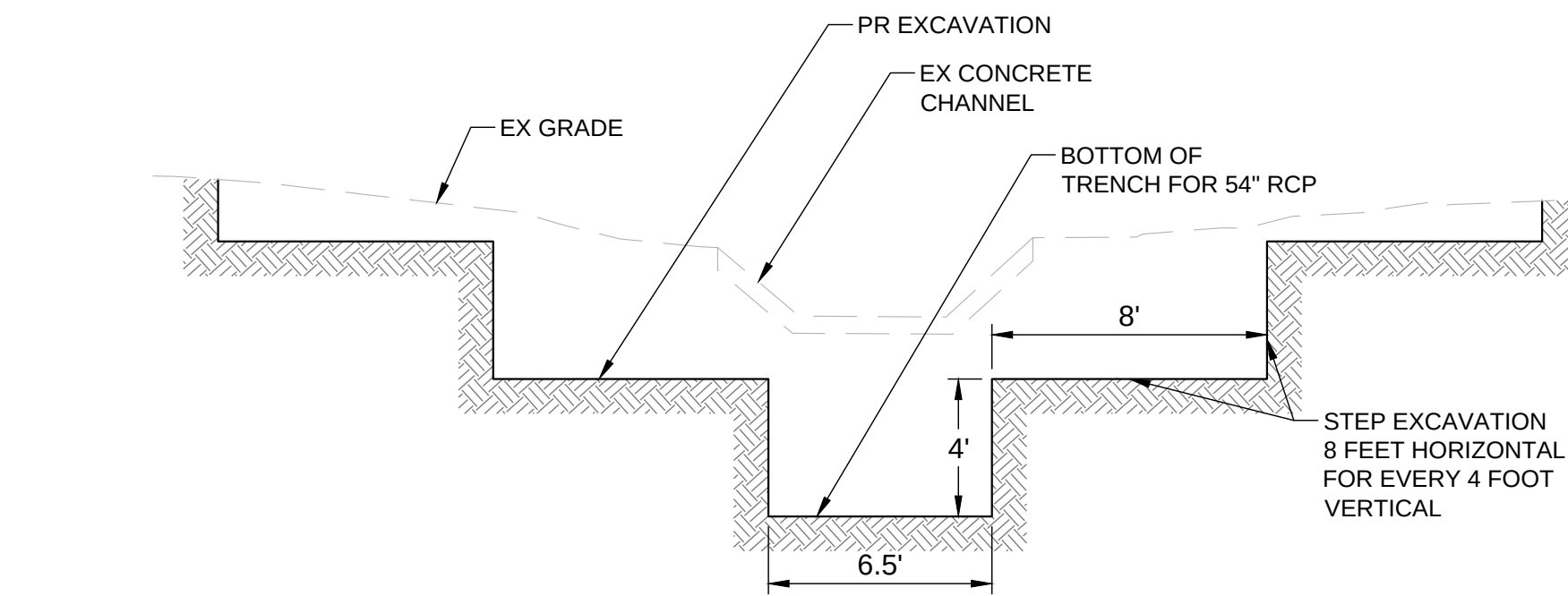
1. Rock shall be hard, durable, angular in shape and resist weathering. Rock shall not contain shale. Neither breadth nor thickness of a single stone shall be less than 1/3 its length. Rock shall be well graded. The rock shall contain fines in sufficient quantities to fill voids while allowing point-to-point contact between rocks. Rock suspended in a matrix of fines shall not be allowed. THERE SHALL BE NO VISIBLE VOIDS IN ROCK STRUCTURES.
2. FOR 18" D90 ROCK
70% of rock shall be 6" or larger.
50% of rock shall be 10.5" or larger.
30% of rock shall be 15" or larger.
10% of rock shall be 18" or larger.
3. GRANULAR BACKFILL
MSD Type 1 bedding shall be used for the designated granular backfill.
4. Contractor to provide signed and sealed shop drawings to be approved by the project engineer & MSD. contact MSD 314-335-2072
5. Details shown for private construction only. Refer to MSD specifications and details for public sewer construction.

RIPRAP ROCK SIZE (inches)	PERCENT PASSING
0.001	5
0.4	10
2.5	15
6.0	30
10.5	50
15.0	70
17.5	85
18.0	90

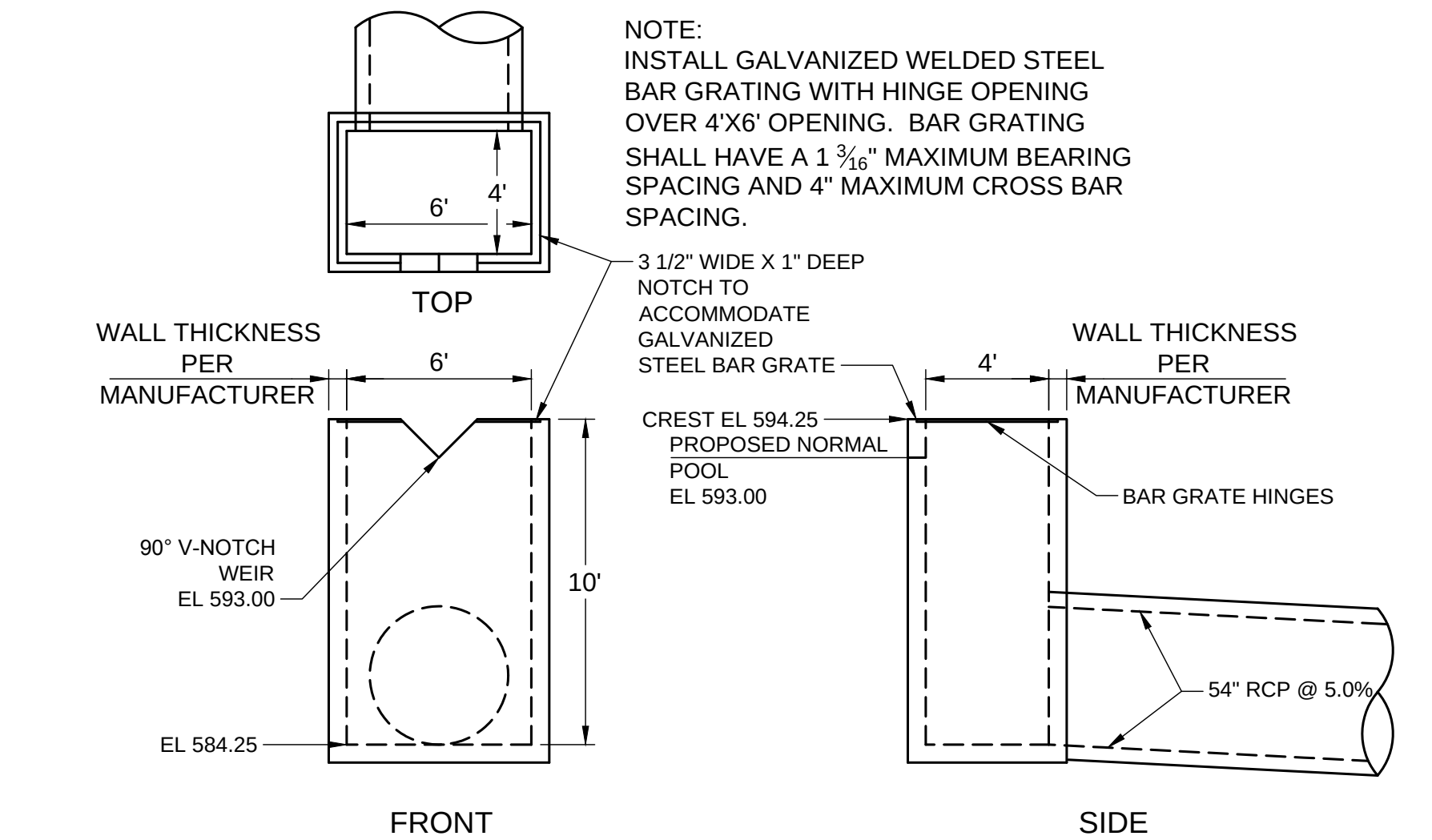
7 ROCK GRADATIONS NTS



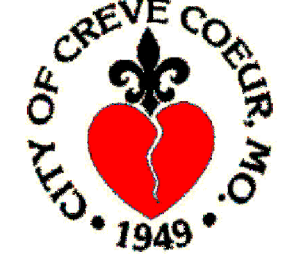
9 NO TRENCHING OVER EXISTING SANITARY SEWER NTS



10 OVER EXCAVATION BENCHING FOR DAM EMBANKMENT NTS



11 4'X6' PRECAST REINFORCED CONCRETE BOX RISER NTS

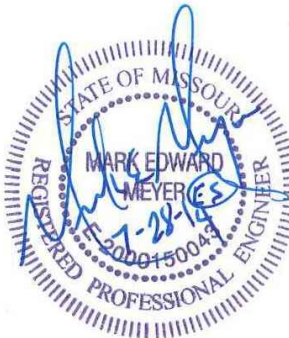


ILINC Engineering Incorporated
MO Certificate of Authority
2000152987
16253 Swingley Ridge Rd.
Suite 100
Chesterfield, MO 63017
Phone (636) 777-3000
Fax (314) 432-5812

Creve Coeur Dam and Channel
11400 Olde Cabin Road
Creve Coeur MO 63141
Creve Coeur, St Louis County, Missouri

THE PROFESSIONAL WHOSE SIGNATURE AND PERSONAL SEAL APPEAR HEREON, ASSUMES RESPONSIBILITY ONLY FOR WHAT APPEARS ON THIS PAGE, AND DISCLAIMS (PURSUANT TO SECTION 372.01 ALL RISK) ANY RESPONSIBILITY FOR ALL OTHER PLANS, SPECIFICATIONS, ESTIMATES, REPORTS, OR OTHER DOCUMENTS OR INSTRUMENTS NOT SEALED BY THE UNDERSIGNED PROFESSIONAL RELATING TO OR INTENDED TO BE USED FOR ANY PART OR PARTS OF THE PROJECT TO WHICH THIS PAGE REFERS.

Professional Engineer Seal
Mark Edward Meyer - Engineer
MO# 2000150043



Expiration Date: Dec. 31, 2014

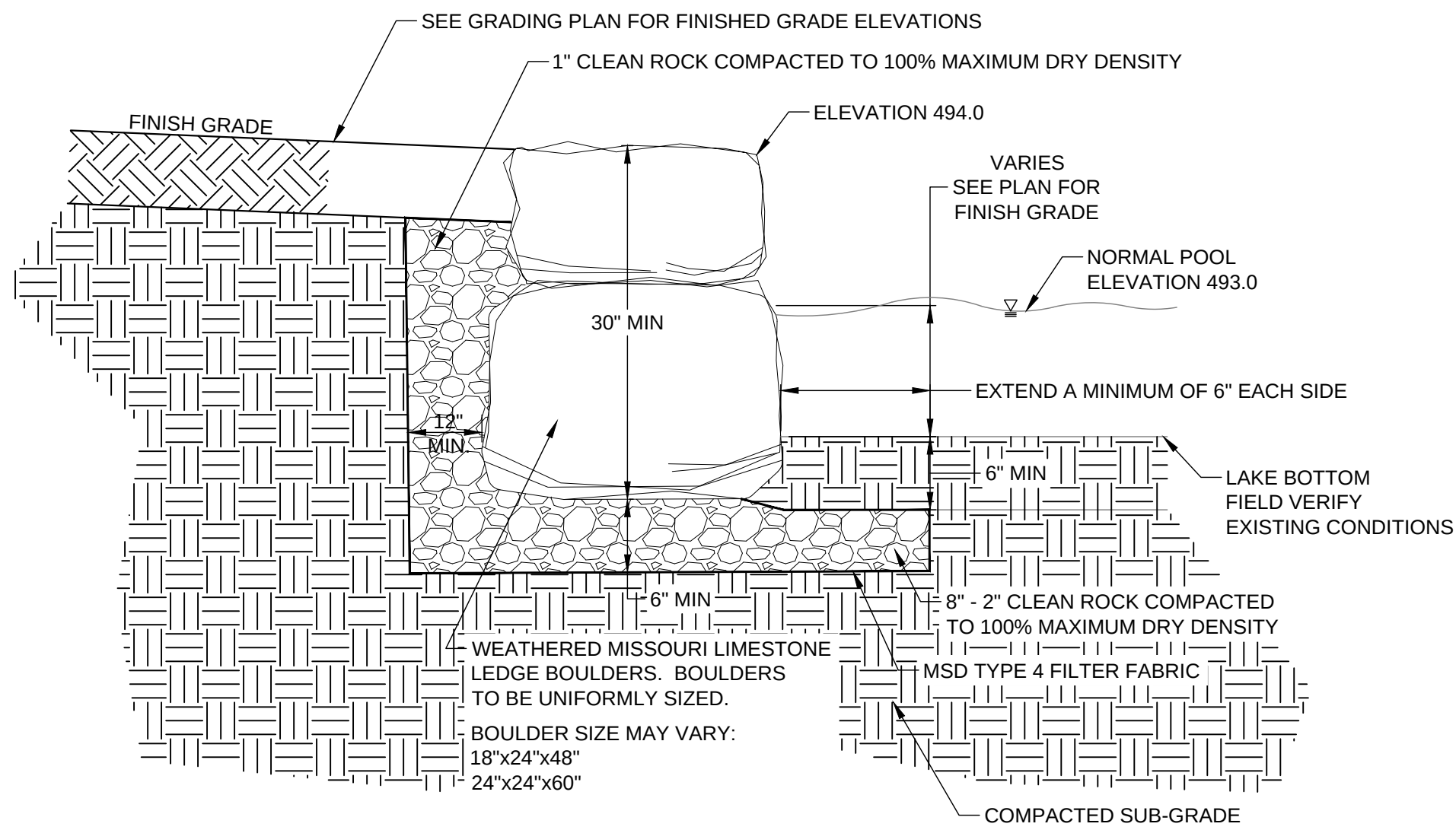
Rev	Date	Description
-	-	-
-	-	-
-	-	-
-	-	-

Project No. 1311
Designed: MEM
Drawn: JDF
Checked: TPD
Approved: MEM
Sheet Title:

DETAILS

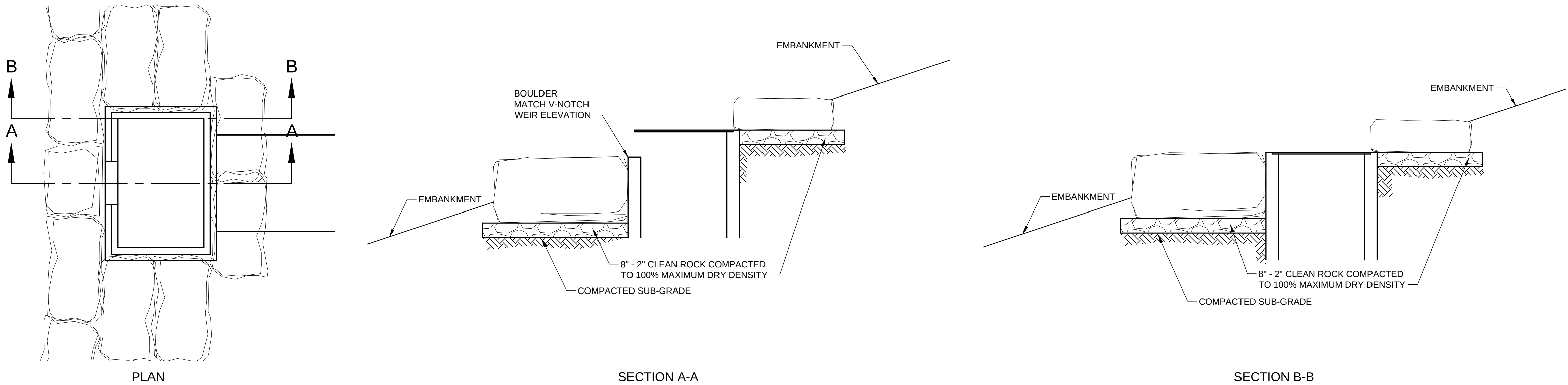
Sheet Number:

C-3.0



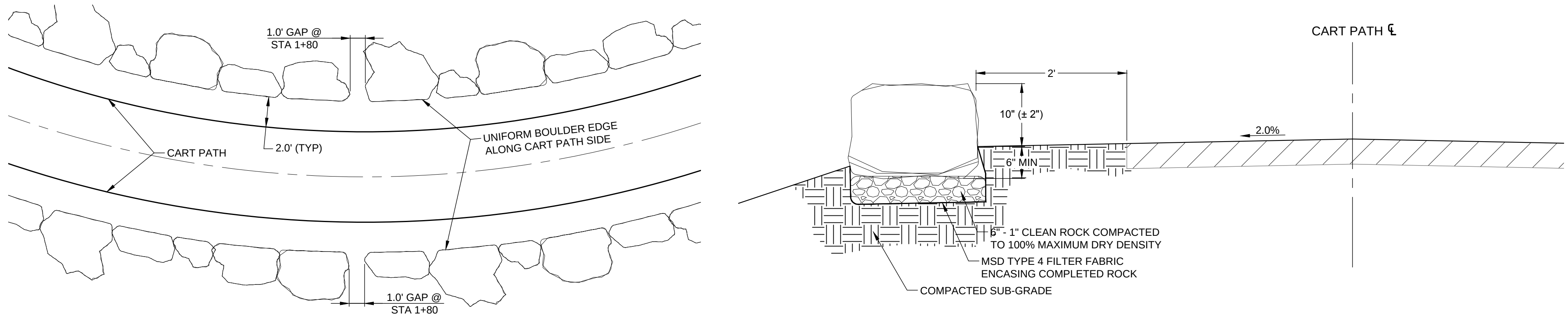
12 BOULDER LAKE EDGE DETAIL

(FOR REFERENCE ONLY) NTS



13 DECORATIVE BOULDERS AT POND RISER

NTS



14 DECORATIVE BOULDER EDGE CART PATH DETAIL

NTS

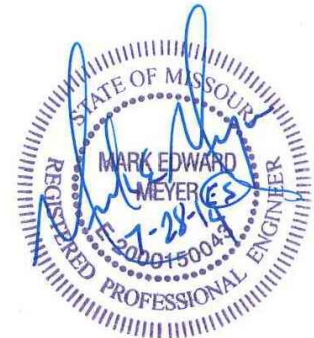


ILINC Engineering Incorporated
MO Certificate of Authority
2000152987
16253 Swingley Ridge Rd.
Suite 100
Chesterfield, MO 63017
Phone (636) 777-3000
Fax (314) 432-5812

Creve Coeur Dam and Channel
11400 Olde Cabin Road
Creve Coeur MO 63141
Creve Coeur, St Louis County, Missouri

THE PROFESSIONAL WHOSE SIGNATURE AND PERSONAL SEAL APPEAR HEREON, ASSUMES RESPONSIBILITY ONLY FOR WHAT APPEARS ON THIS PAGE, AND DISCLAIMS (PURSUANT TO SECTION 327 ALL RSMO) ANY RESPONSIBILITY FOR ALL OTHER PLANS, SPECIFICATIONS, ESTIMATES, REPORTS, OR OTHER DOCUMENTS OR INSTRUMENTS NOT SEALED BY THE UNDERSIGNED PROFESSIONAL RELATING TO OR INTENDED TO BE USED FOR ANY PART OR PARTS OF THE PROJECT TO WHICH THIS PAGE REFERS.

Professional Engineer Seal
Mark Edward Meyer - Engineer
MO# 2000150043



Expiration Date: Dec. 31, 2014

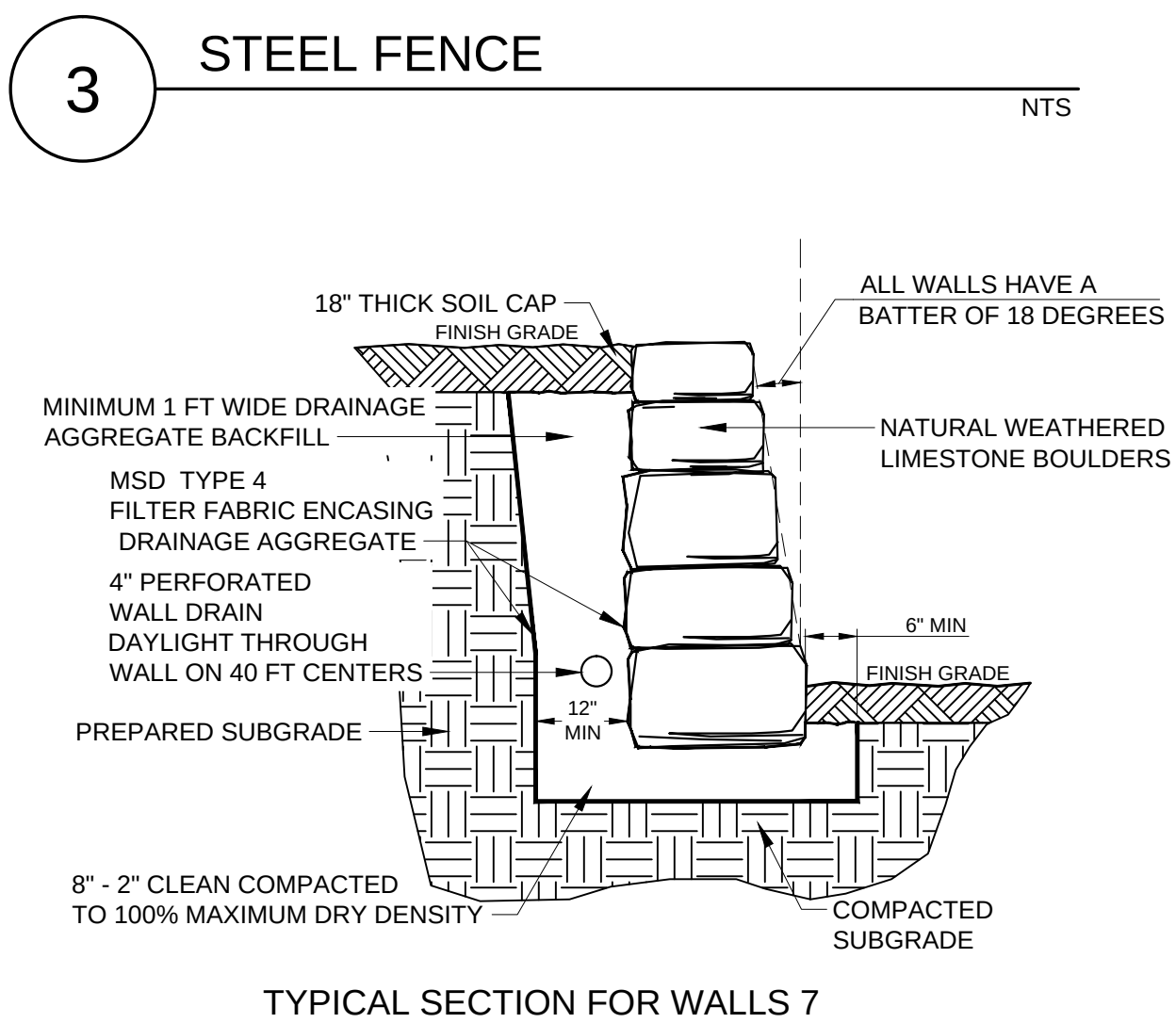
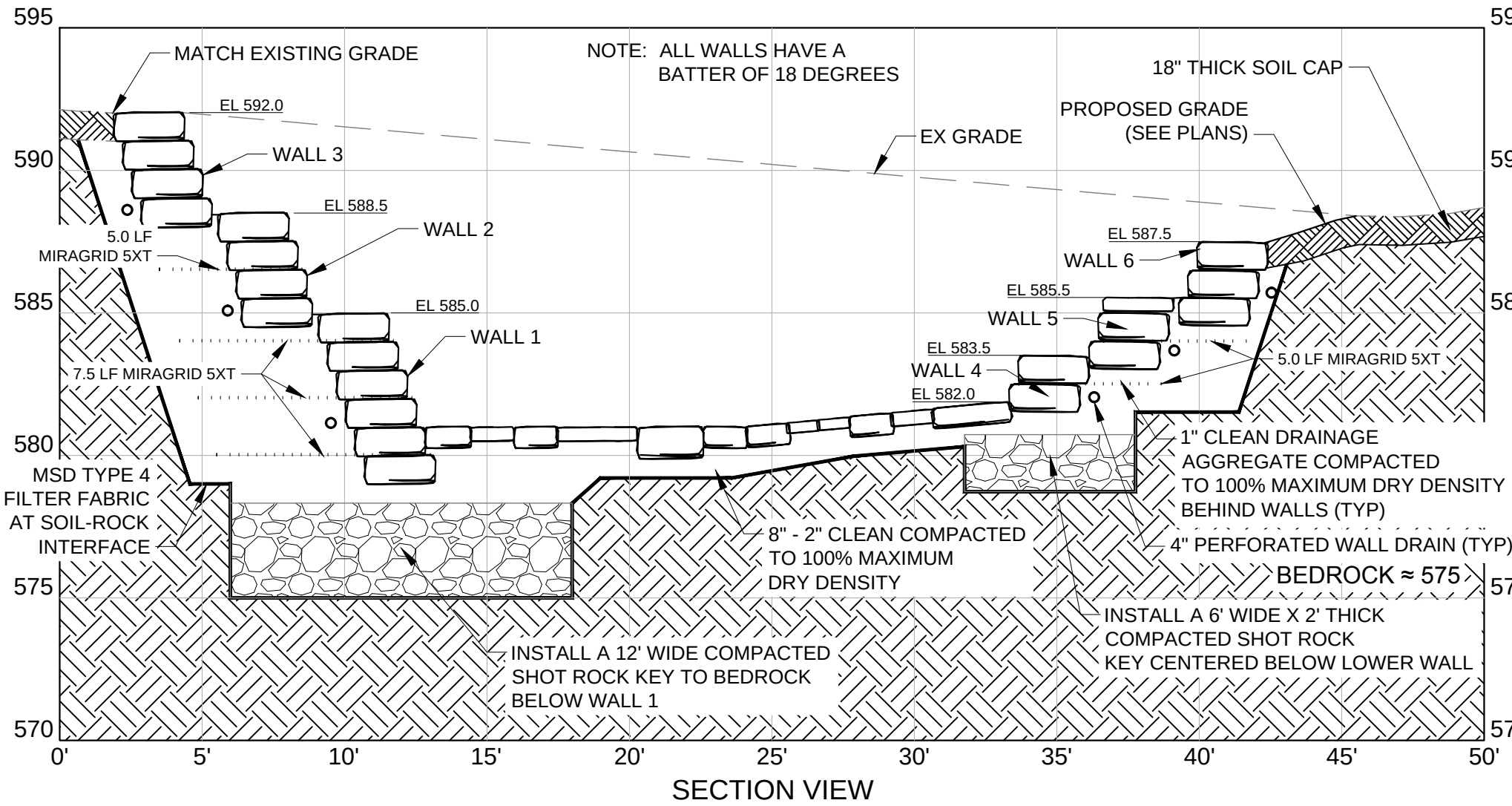
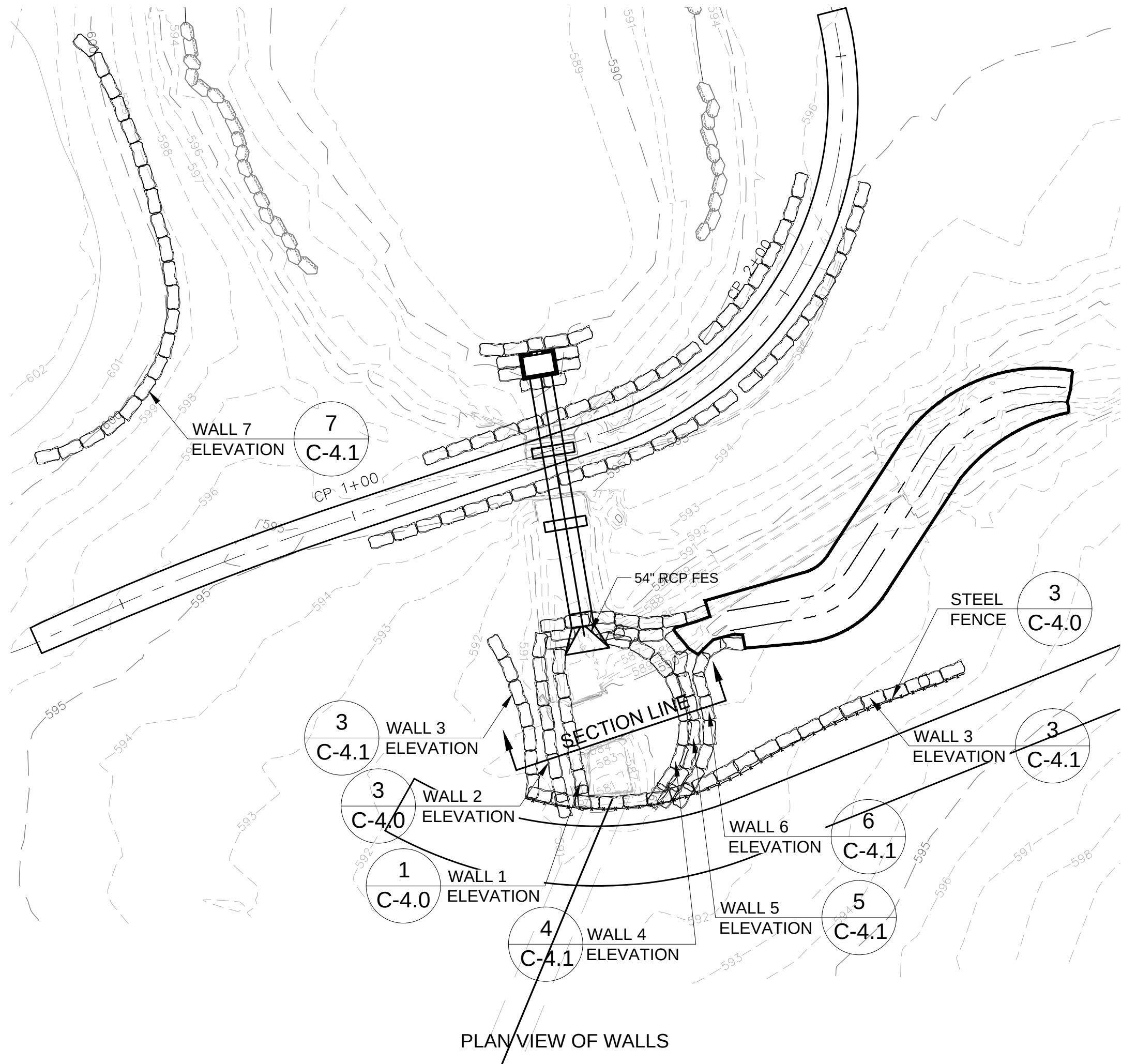
Rev	Date	Description
-	-	-
-	-	-
-	-	-
-	-	-

Project No. 1311
Designed: MEM
Drawn: JDF
Checked: TPD
Approved: MEM
Sheet Title:

LANDSCAPE
DETAILS

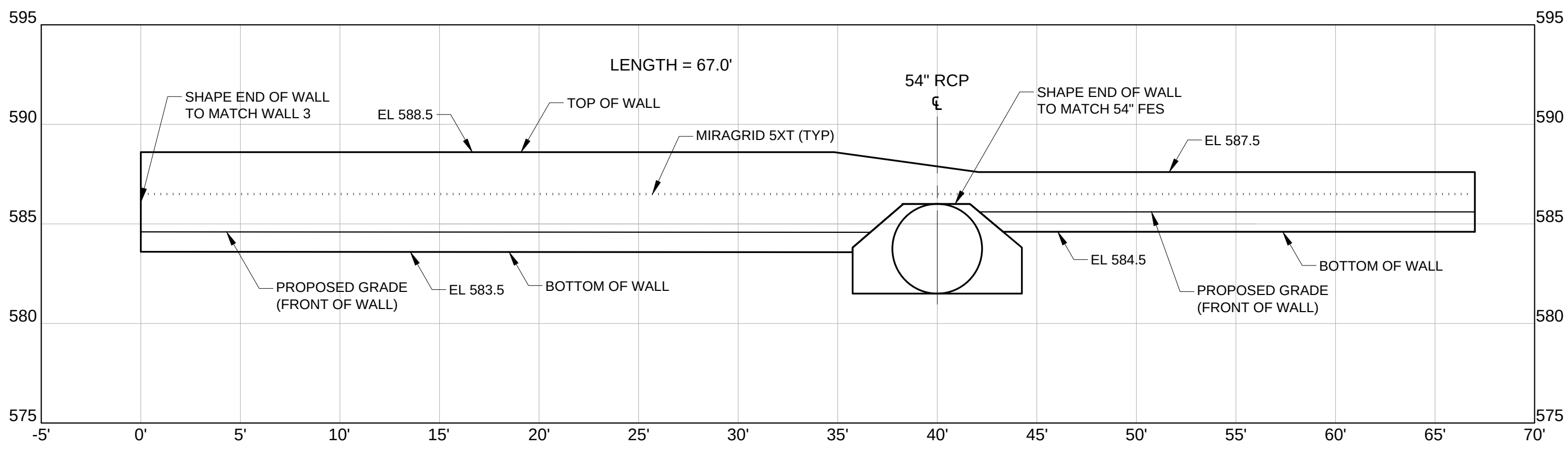
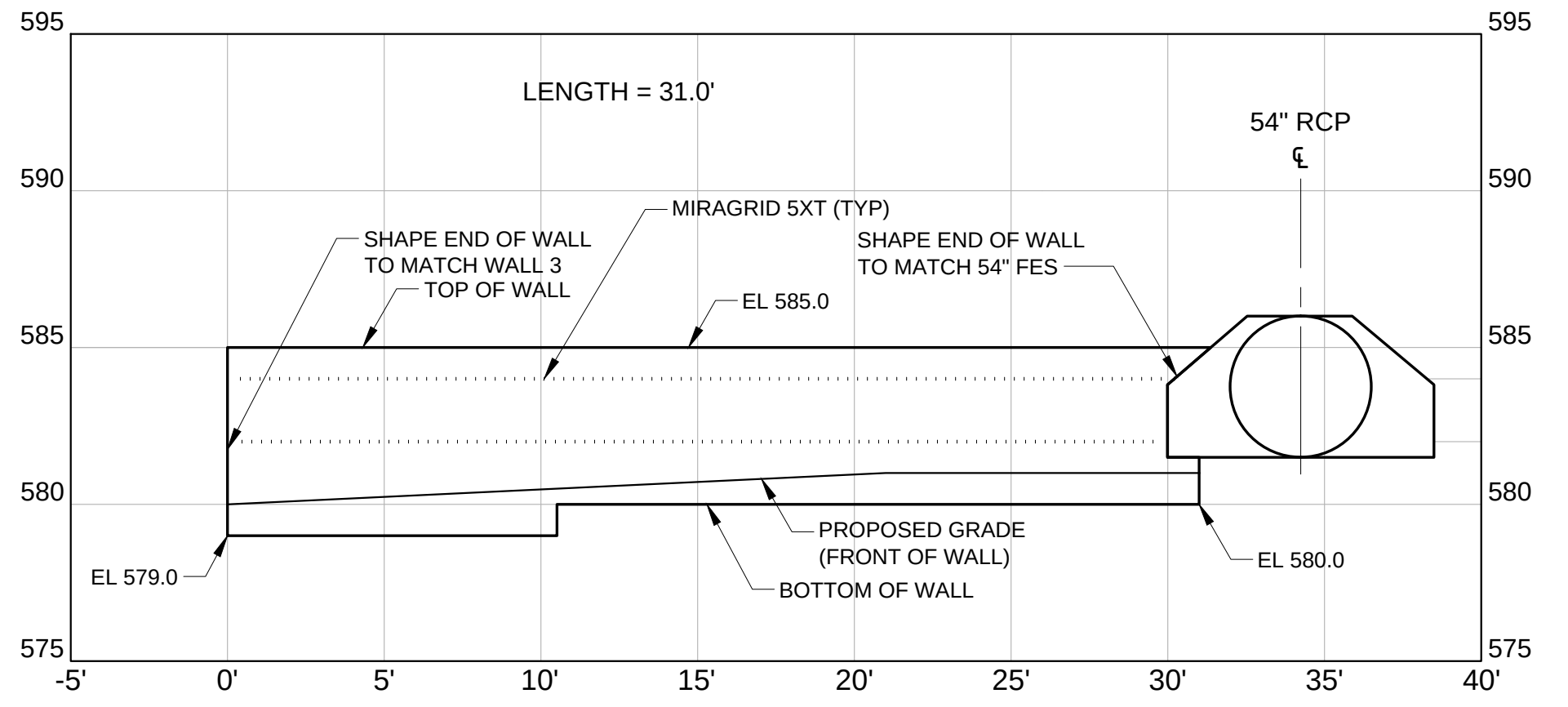
Sheet Number:

C-3.1



STEEL FENCE

BOULDER RETAINING WALLS

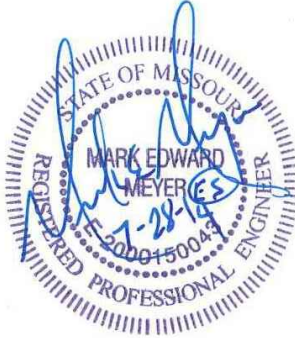


ILINC Engineering Incorporated
MO Certificate of Authority
2000152987
16253 Swingley Ridge Rd.
Suite 100
Chesterfield, MO 63017
Phone (636) 777-3000
Fax (314) 432-5812

Creve Coeur Dam and Channel
11400 Olde Cabin Road
Creve Coeur MO 63141
Creve Coeur, St Louis County, Missouri

THE PROFESSIONAL WHOSE SIGNATURE AND PERSONAL SEAL APPEAR HEREON, ASSUMES RESPONSIBILITY ONLY FOR WHAT APPEARS ON THIS PAGE, AND DISCLAIMS (PURSUANT TO SECTION 307 ALL RSMO) ANY RESPONSIBILITY FOR ALL OTHER PLANS, SPECIFICATIONS, ESTIMATES, REPORTS, OR OTHER DOCUMENTS OR INSTRUMENTS NOT SEALED BY THE UNDERSIGNED PROFESSIONAL RELATING TO OR INTENDED TO BE USED FOR ANY PART OR PARTS OF THE PROJECT TO WHICH THIS PAGE REFERS.

Professional Engineer Seal
Mark Edward Meyer - Engineer
MO# 2000150043



Expiration Date: Dec. 31, 2014

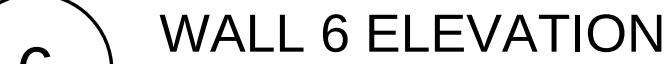
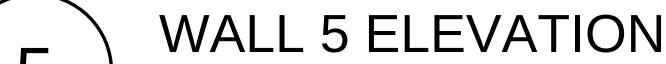
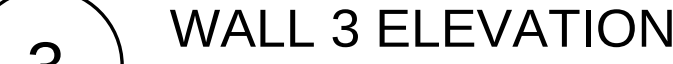
Rev	Date	Description
-	-	-
-	-	-
-	-	-
-	-	-

Project No. 1311
Designed: MEM
Drawn: JDF
Checked: TPD
Approved: MEM
Sheet Title:

WALL DETAILS

Sheet Number:

C-4.0



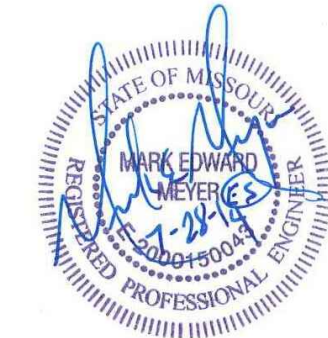
INTUITION
LOGIC

ILINC Engineering Incorporated
MO Certificate of Authority
2000152987
16253 Swingley Ridge Rd.
Suite 100
Chesterfield, MO 63017
Phone (636) 777-3000
Fax (314) 432-5812

Creve Coeur Dam and Channel
11400 Olde Cabin Road
Creve Coeur MO 63141
Creve Coeur, St Louis County, Missouri

THE PROFESSIONAL WHOSE SIGNATURE AND PERSONAL SEAL APPEAR HEREON, ASSUMES RESPONSIBILITY ONLY FOR WHAT APPEARS ON THIS PAGE, AND DISCLAIMS (PURSUANT TO SECTION 327.41 RSMO) ANY RESPONSIBILITY FOR ALL OTHER PLANS, SPECIFICATIONS, ESTIMATES, REPORTS, OR OTHER DOCUMENTS OR INSTRUMENTS NOT SEALED BY THE UNDERSIGNED PROFESSIONAL RELATING TO OR INTENDED TO BE USED FOR ANY PART OR PARTS OF THE PROJECT TO WHICH THIS PAGE REFERS.

Professional Engineer Seal
Mark Edward Meyer - Engineer
MO# 2000150043



Expiration Date: Dec. 31, 2014

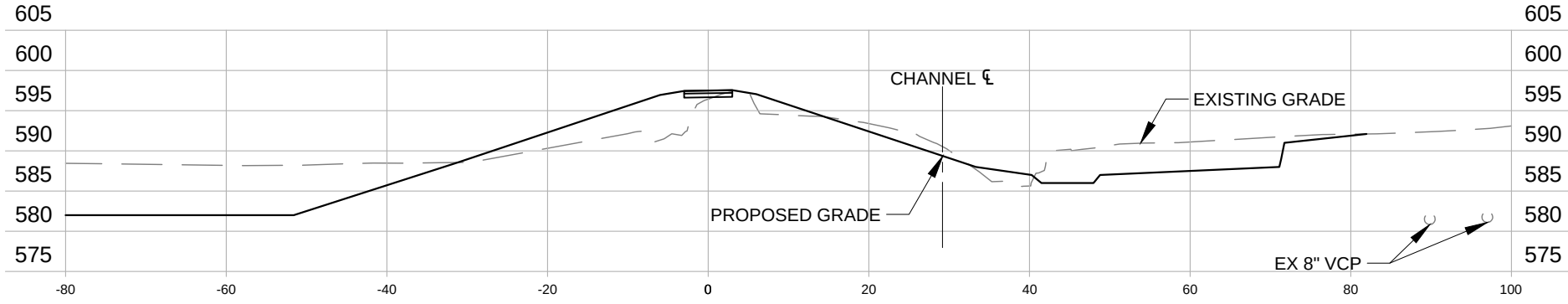
Rev	Date	Description
*	*	*
*	*	*
*	*	*
*	*	*

Project No. 1311
Designed: MEM
Drawn: JDF
Checked: TPD
Approved: MEM
Sheet Title:

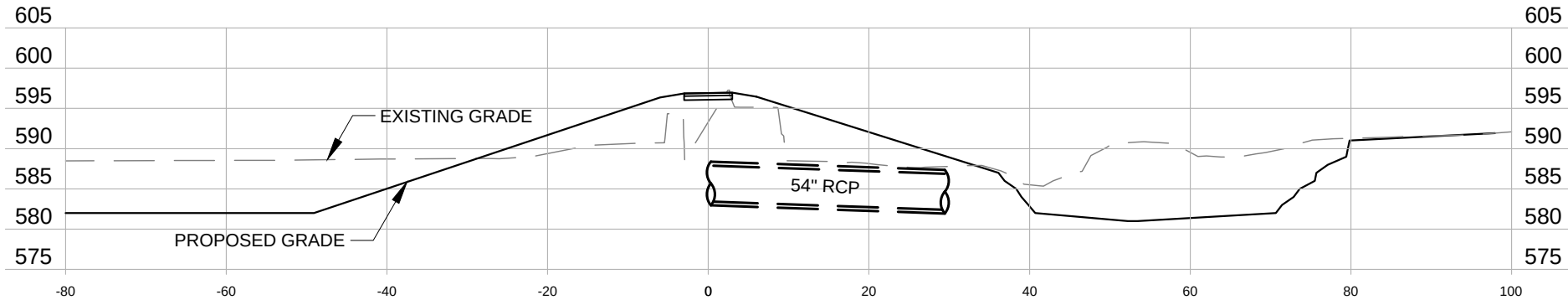
WALL DETAILS

Sheet Number:

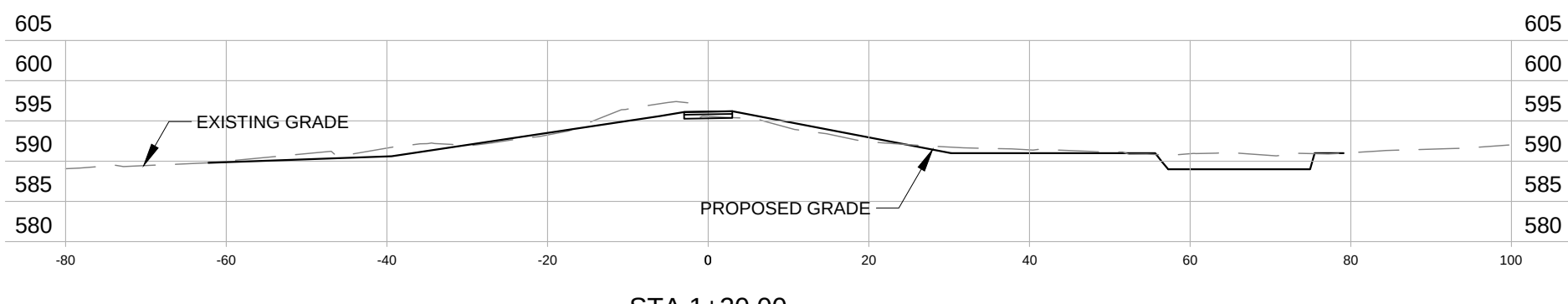
C-4.1



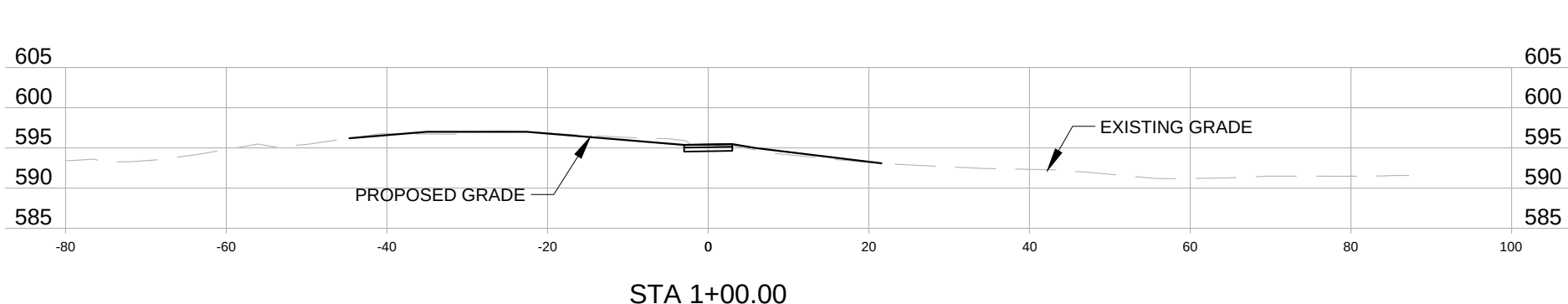
STA 1+60.00



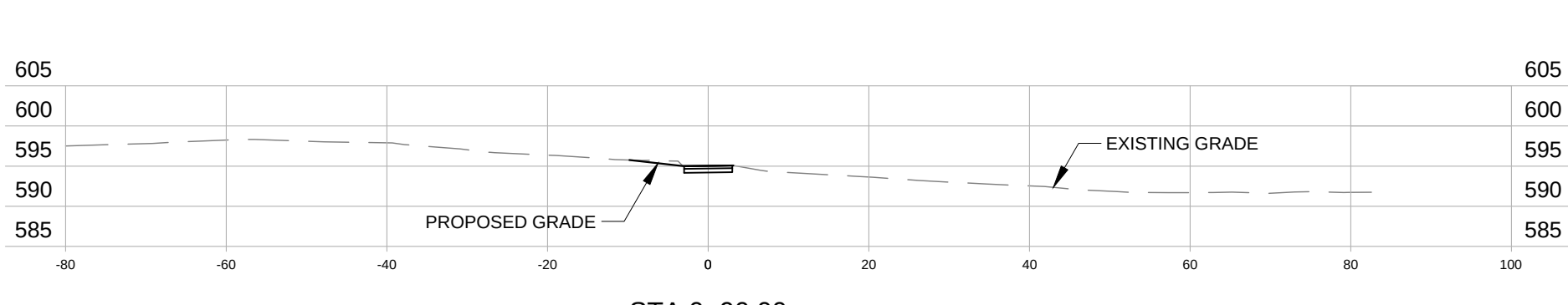
STA 1+40.00



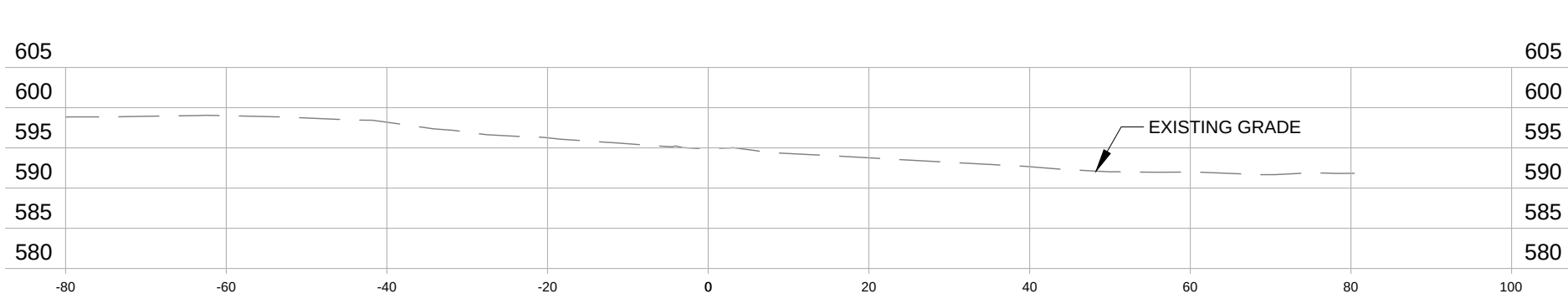
STA 1+20.00



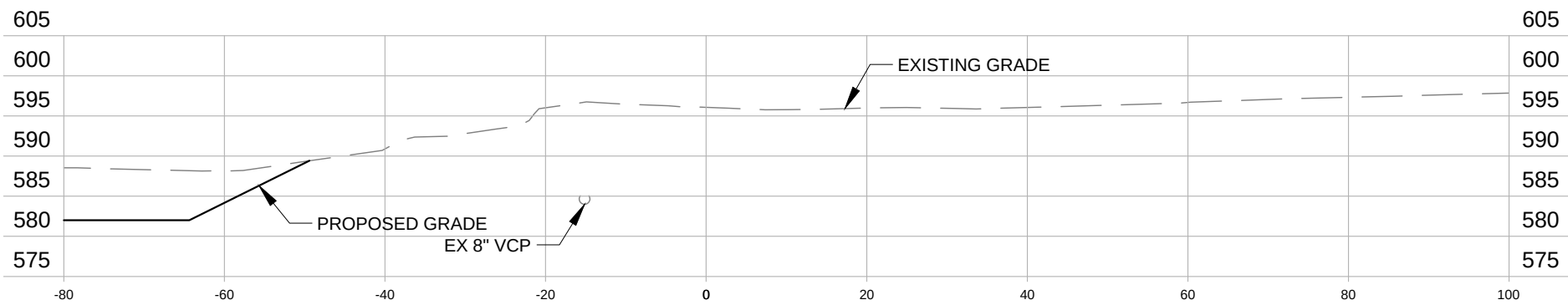
STA 1+00.00



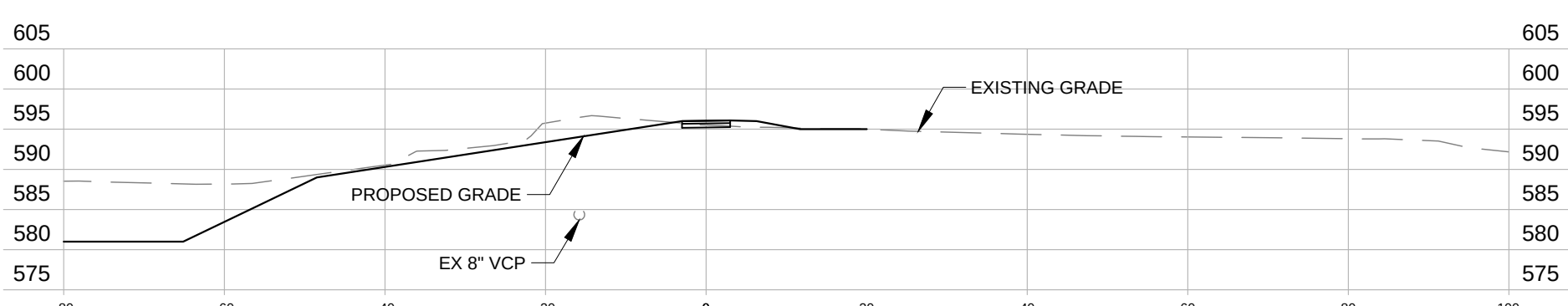
STA 0+90.00



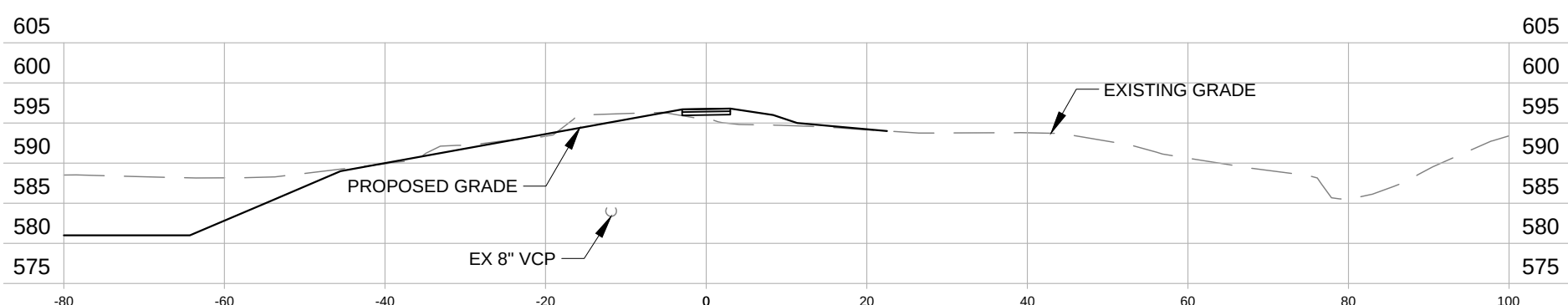
STA 0+85.00



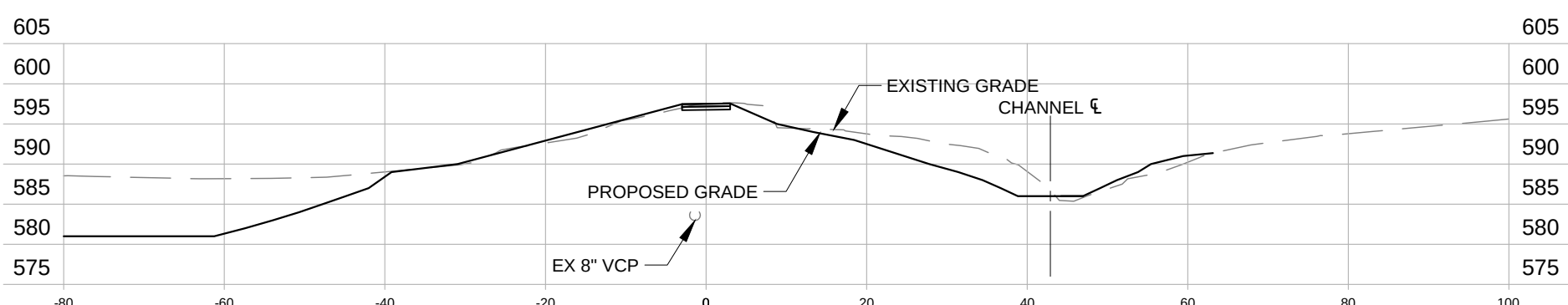
STA 2+60.00



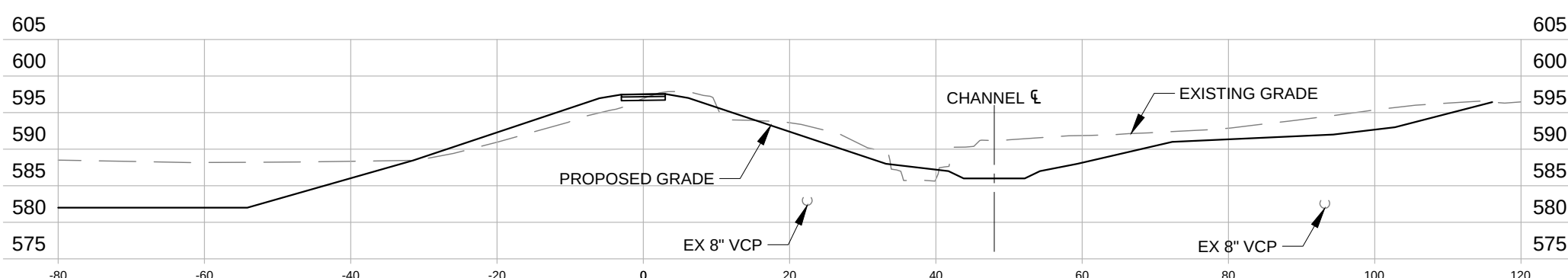
STA 2+40.00



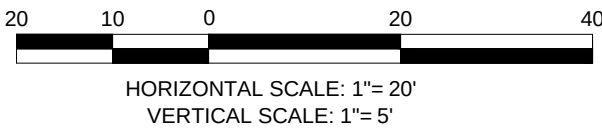
STA 2+20.00



STA 2+00.00



STA 1+80.00



MSD P# - P29963-00, BASEMAP 17N4

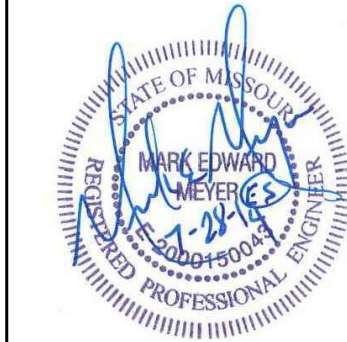


INTUITION LOGIC
ILINC Engineering Incorporated
MO Certificate of Authority
2000152987
16253 Swingley Ridge Rd.
Suite 100
Chesterfield, MO 63017
Phone (636) 777-3000
Fax (314) 432-5812

Creve Coeur Dam and Channel
11400 Olde Cabin Road
Creve Coeur MO 63141
Creve Coeur, St Louis County, Missouri

THE PROFESSIONAL WHOSE SIGNATURE AND PERSONAL SEAL APPEAR HEREON, ASSUMES RESPONSIBILITY ONLY FOR WHAT APPEARS ON THIS PAGE, AND DISCLAIMS (PURSUANT TO SECTION 327 ALL RSMO) ANY RESPONSIBILITY, FOR ALL OTHER PLANS, SPECIFICATIONS, ESTIMATES, REPORTS, OR OTHER DOCUMENTS OR INSTRUMENTS NOT SEALED BY THE UNDERSIGNED PROFESSIONAL RELATING TO OR INTENDED TO BE USED FOR ANY PART OR PARTS OF THE PROJECT TO WHICH THIS PAGE REFERS.

Professional Engineer Seal
Mark Edward Meyer - Engineer
MO# 2000150043



Expiration Date: Dec. 31, 2014

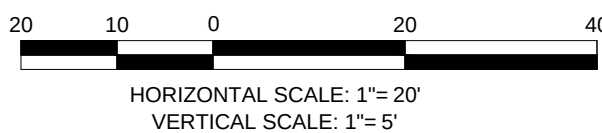
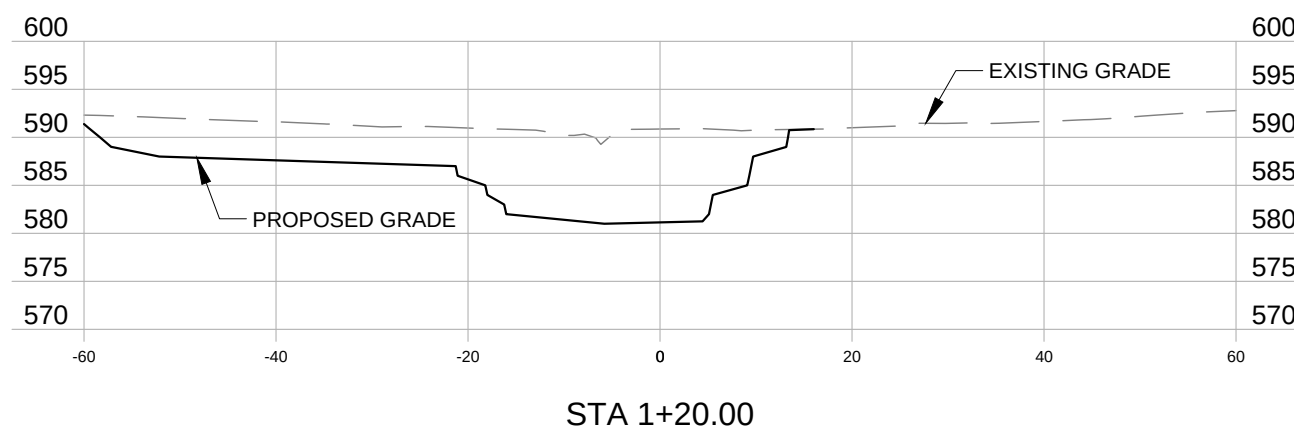
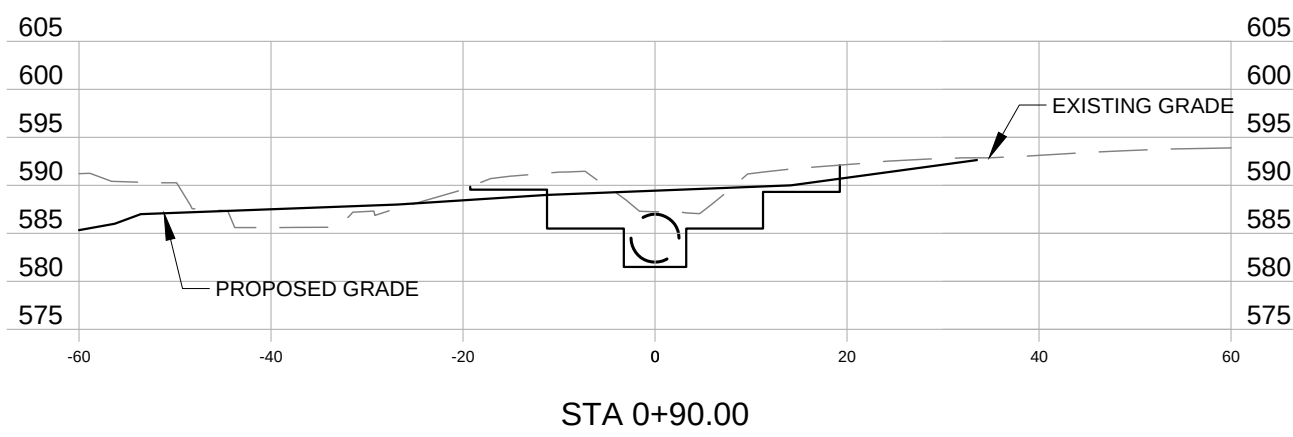
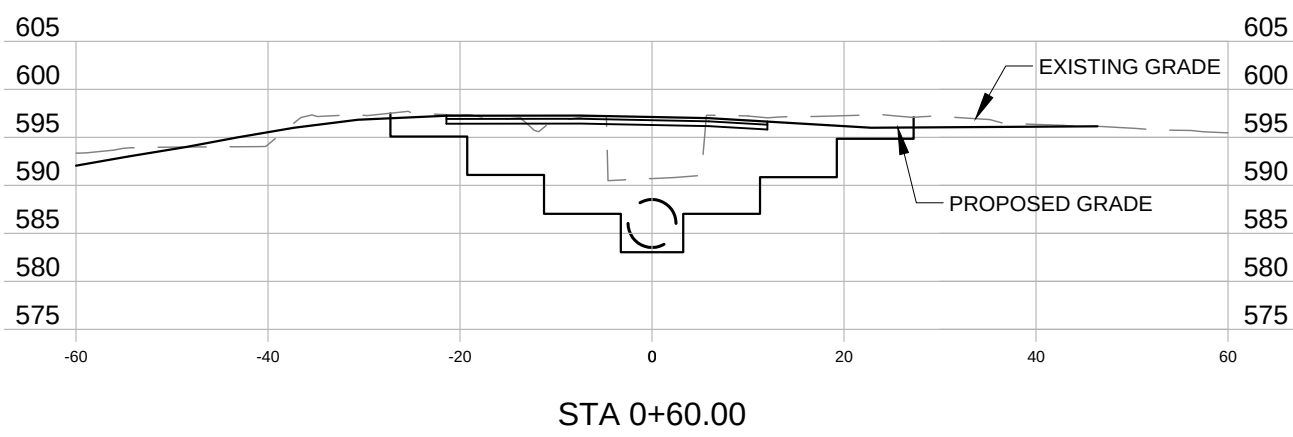
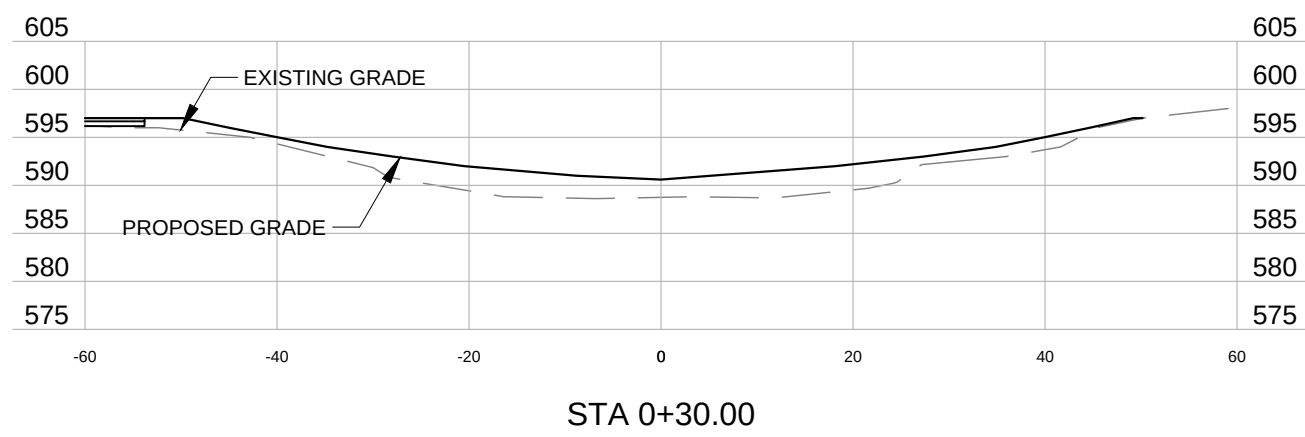
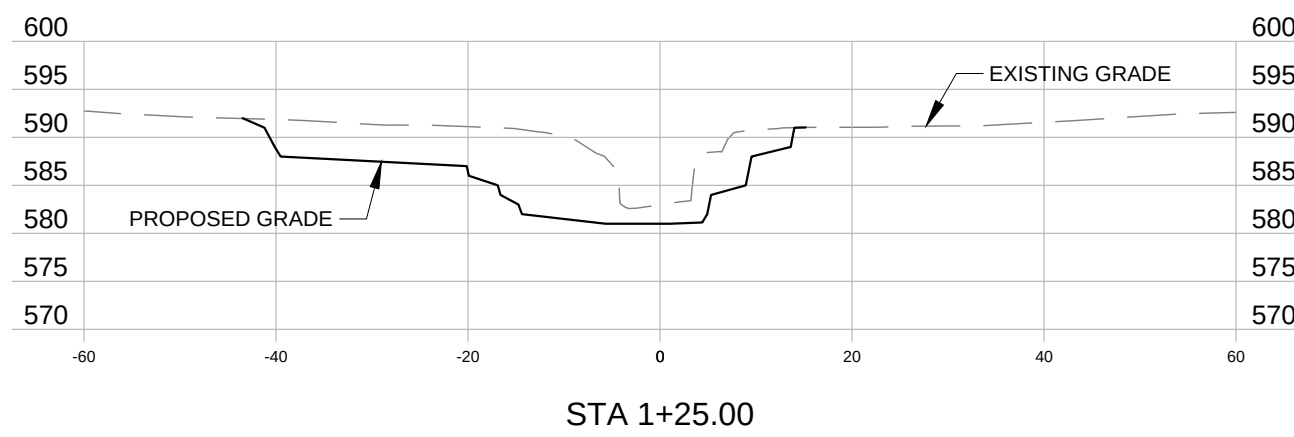
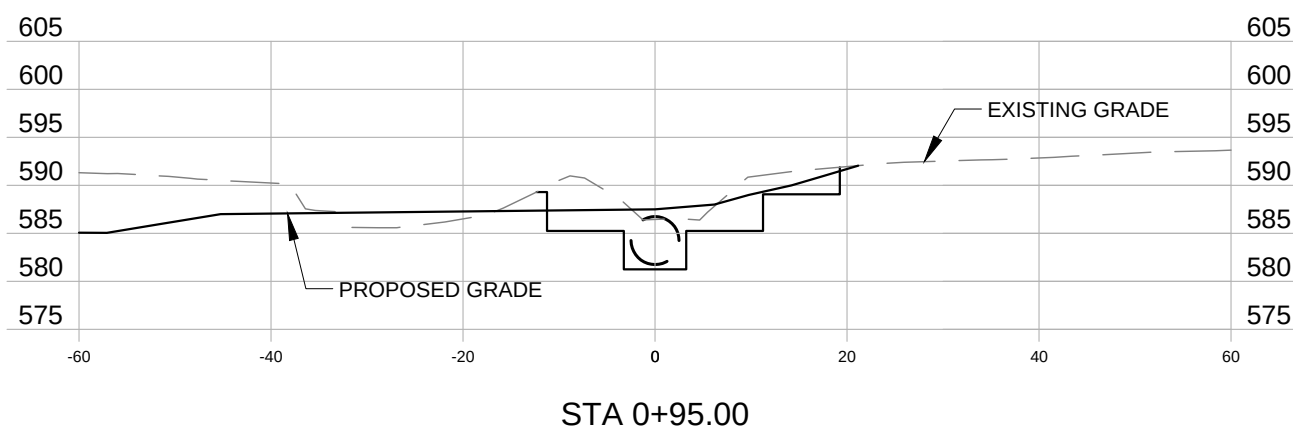
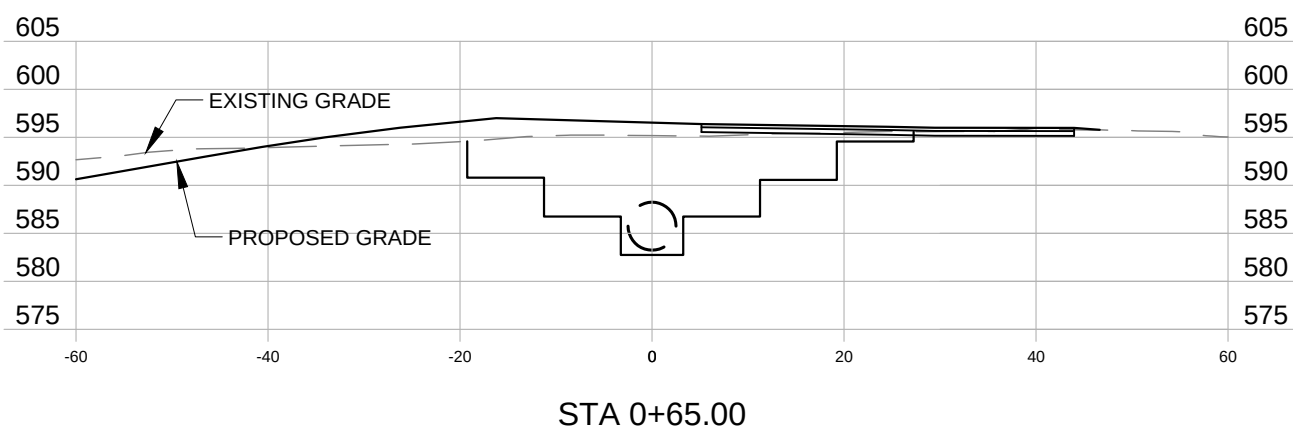
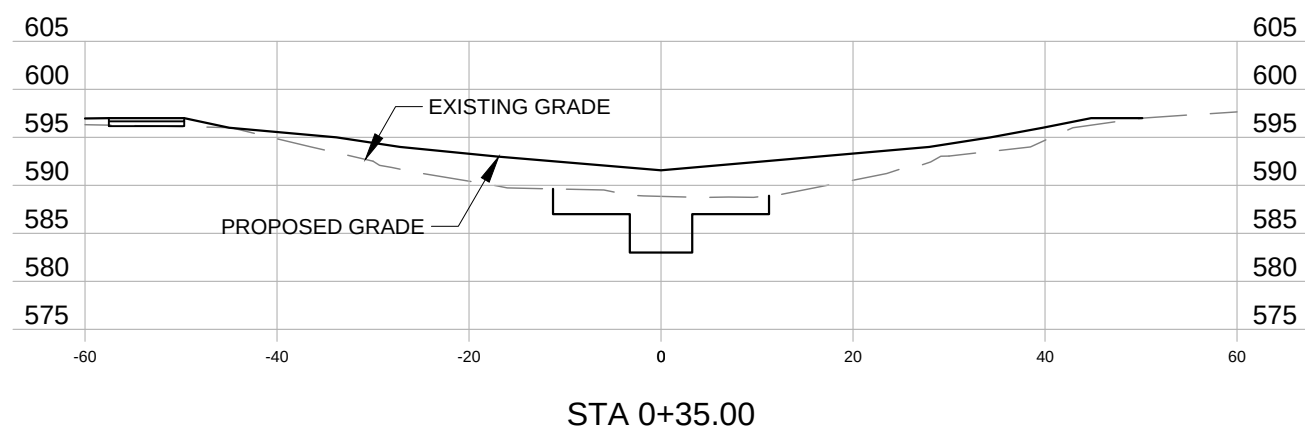
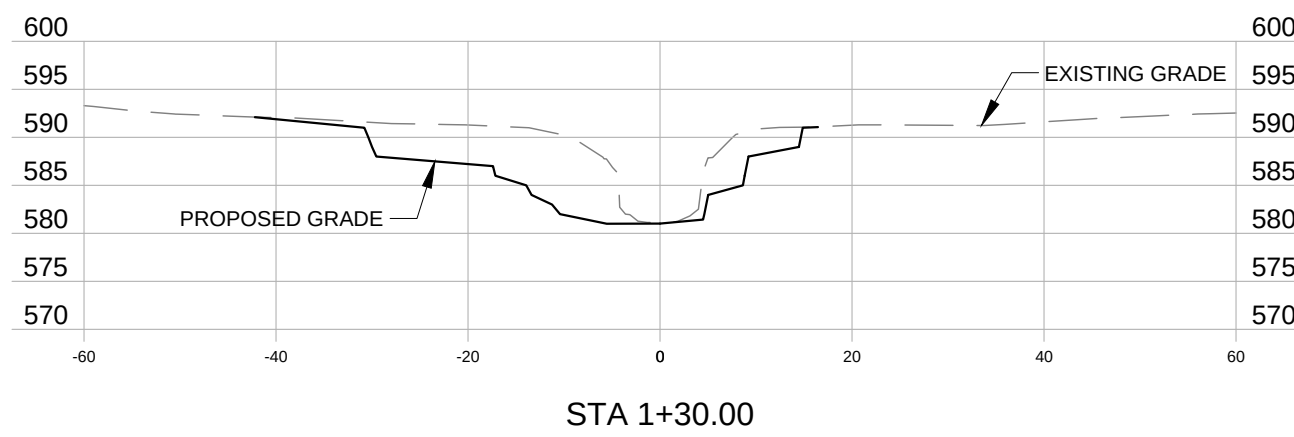
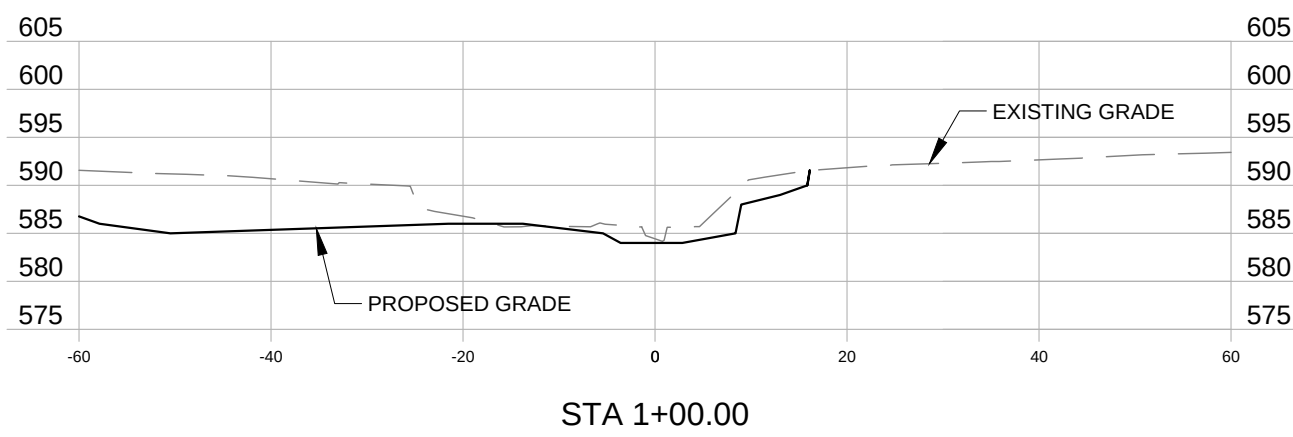
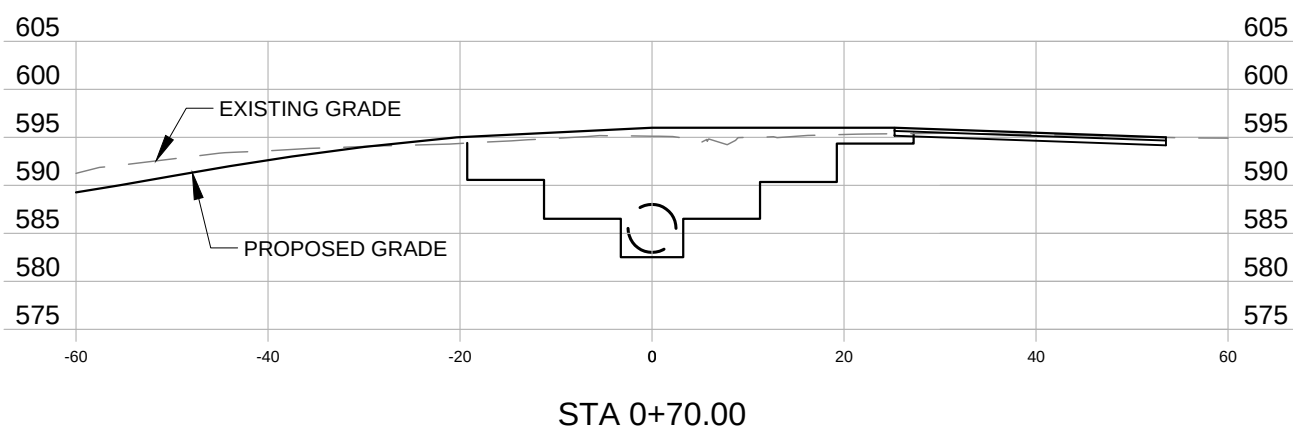
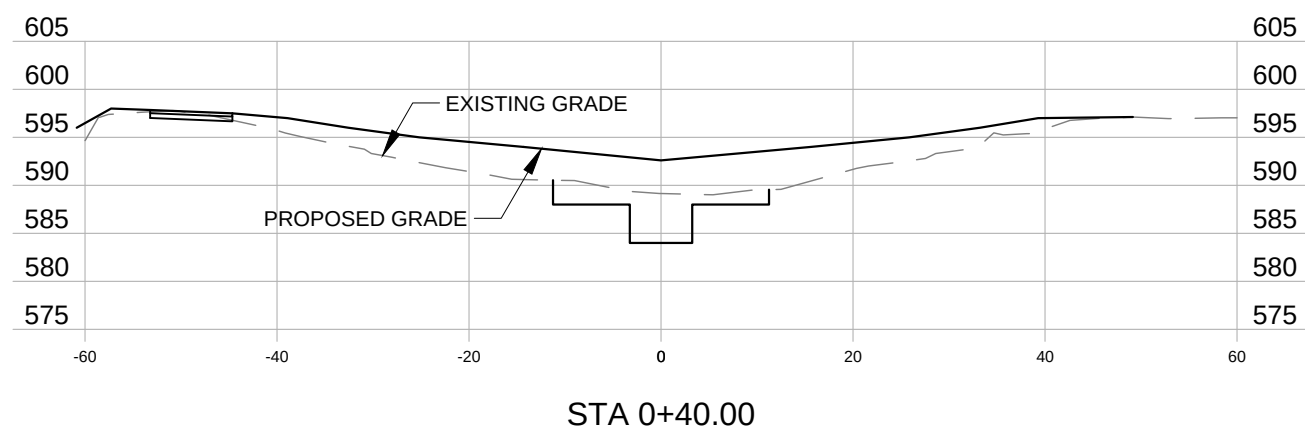
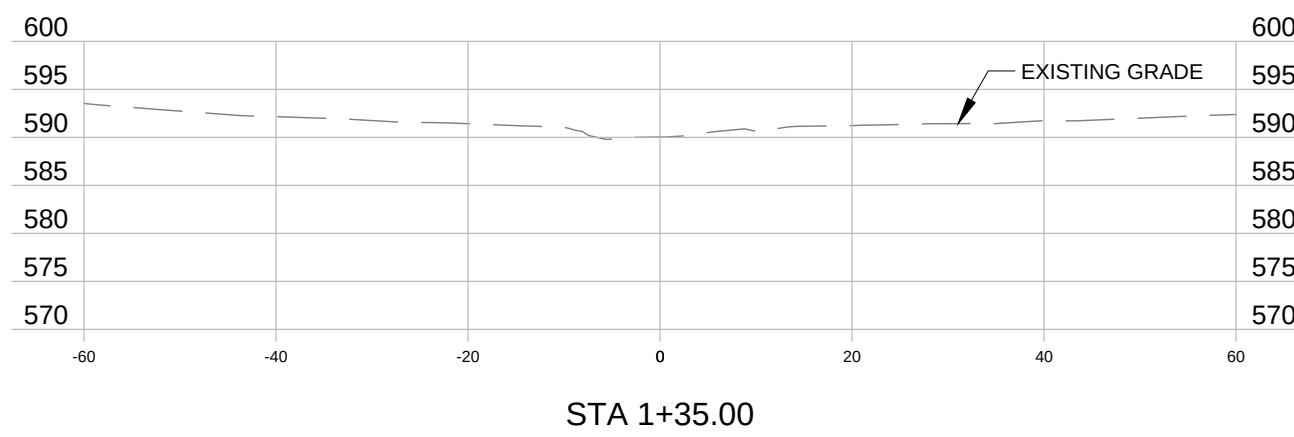
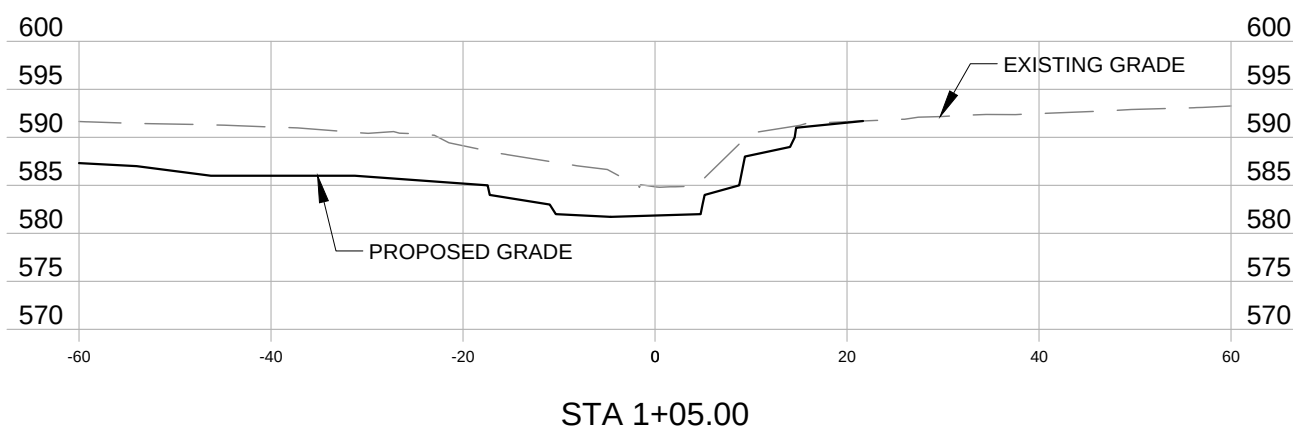
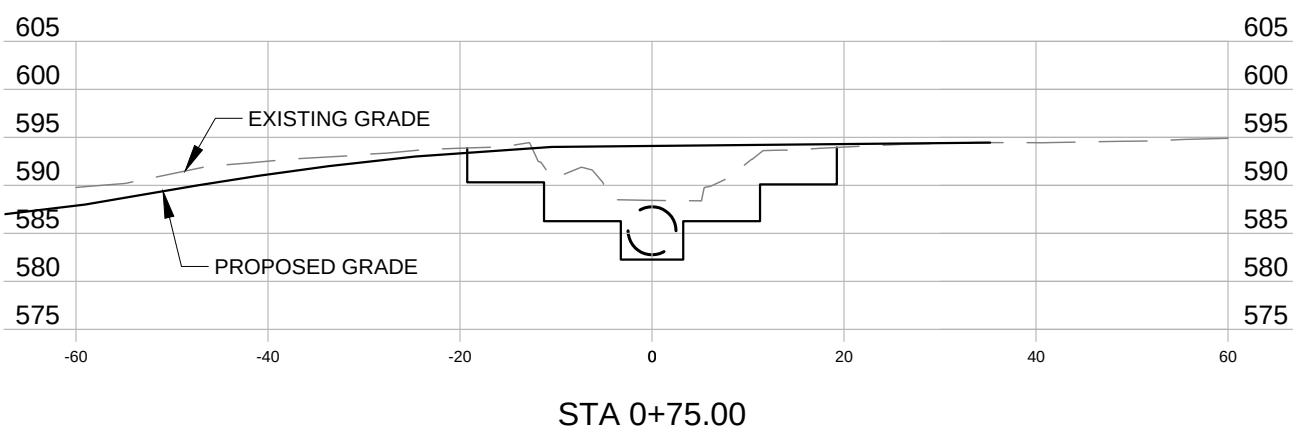
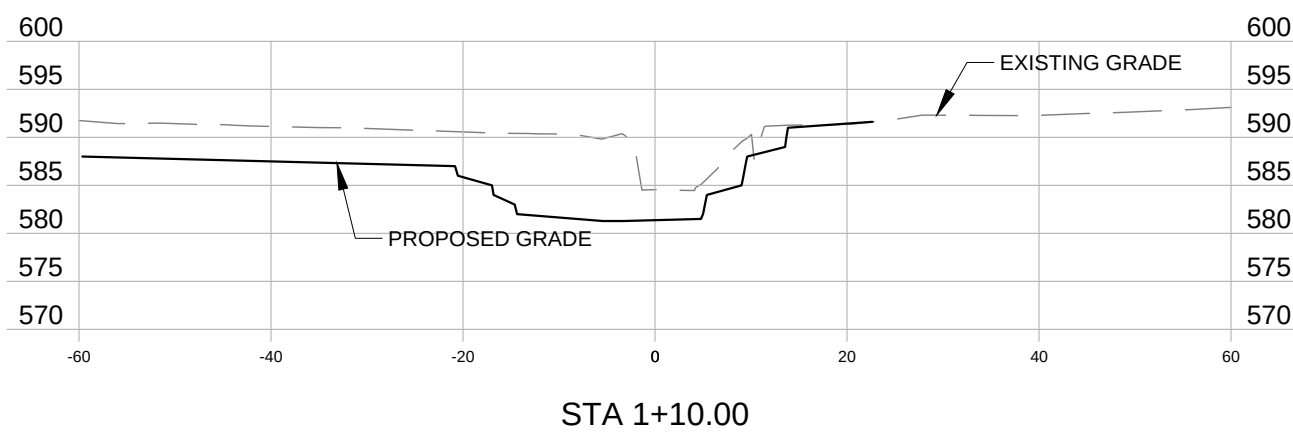
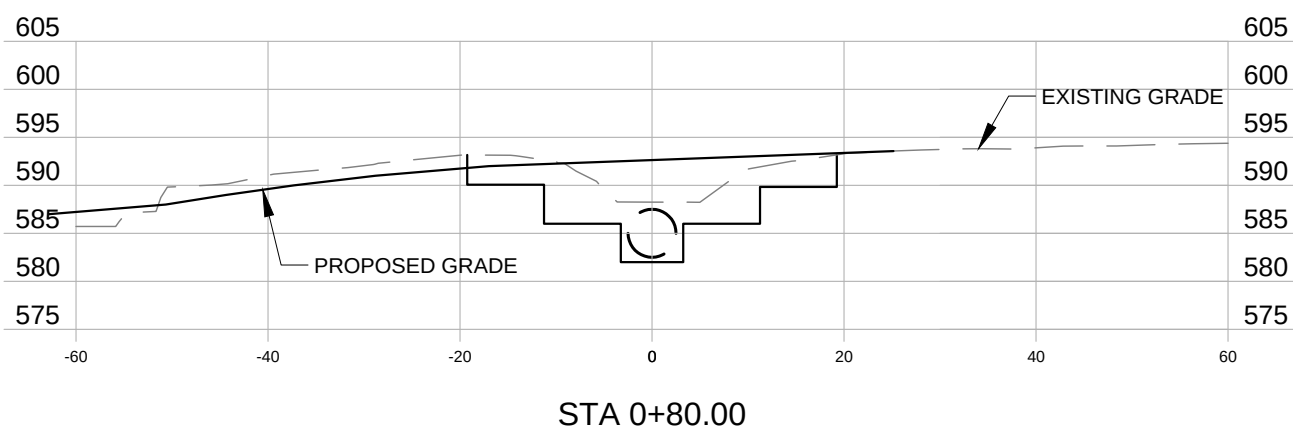
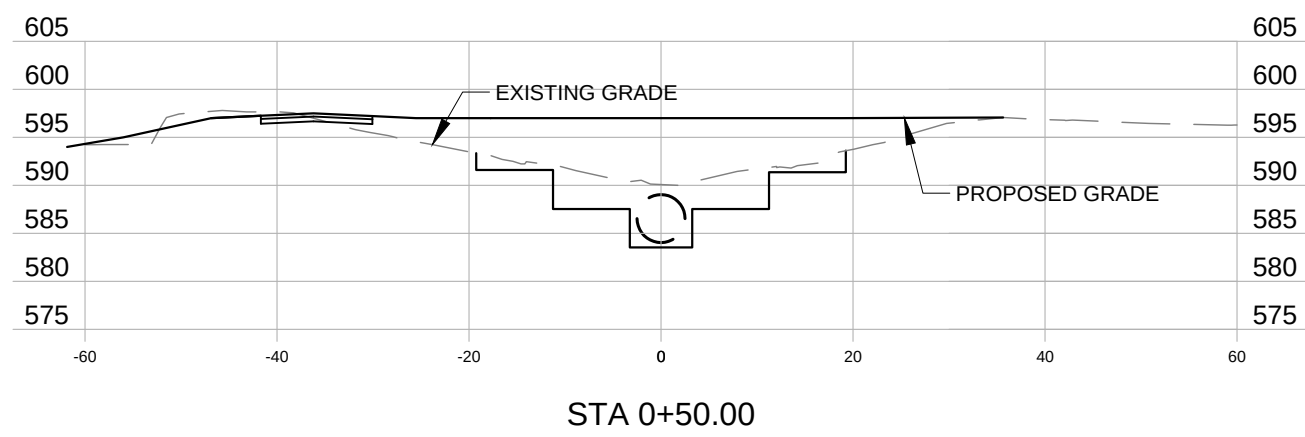
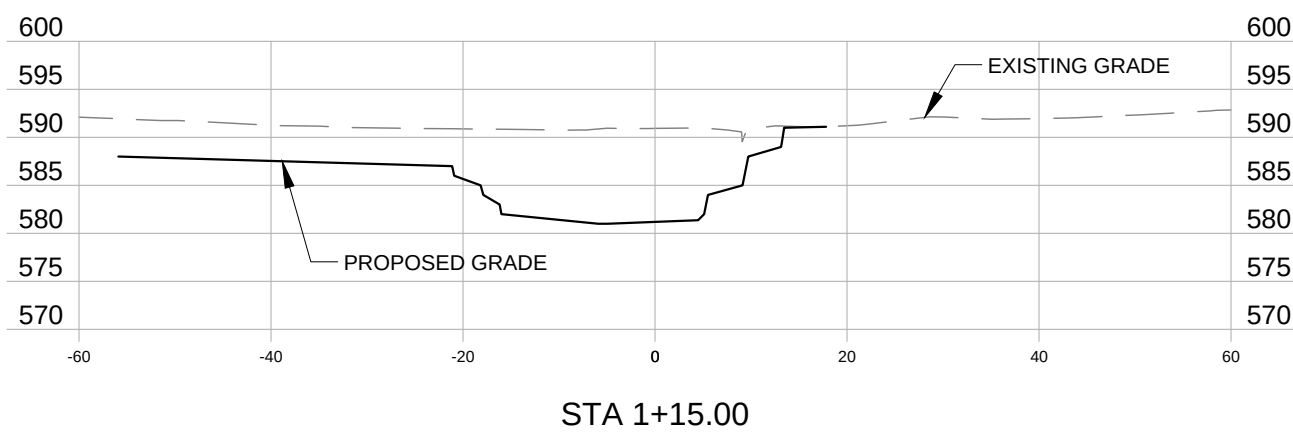
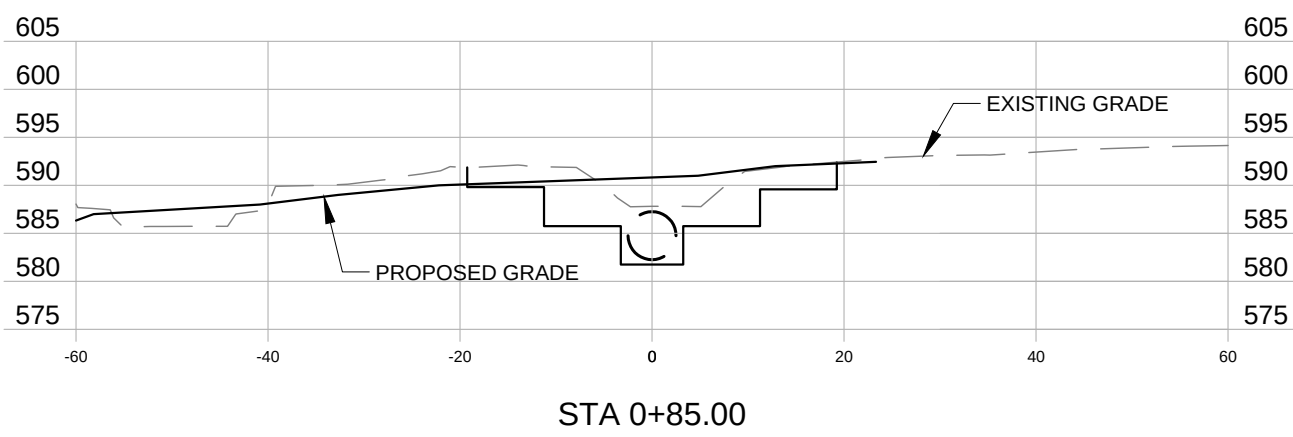
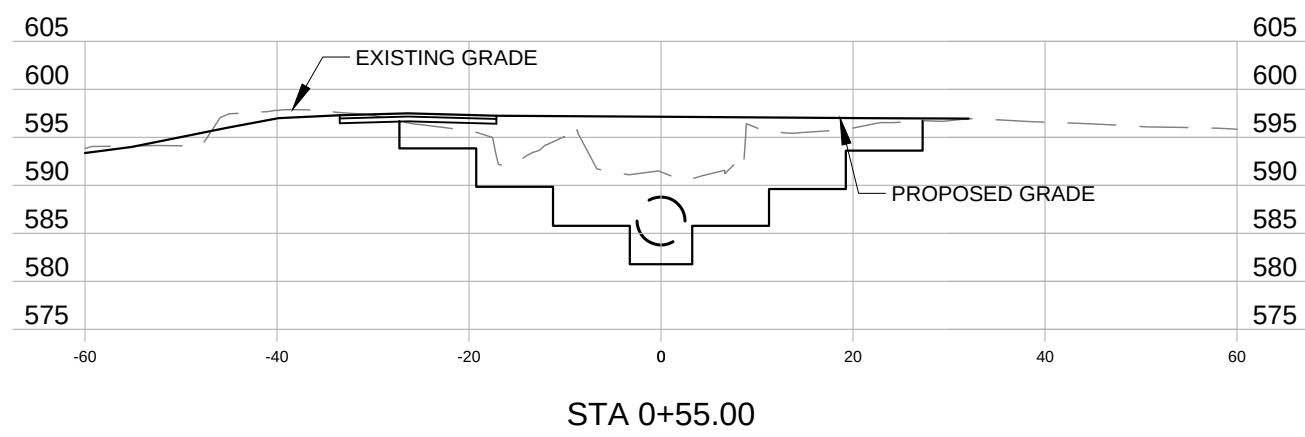
Rev	Date	Description
-	-	-
-	-	-
-	-	-
-	-	-

Project No. 1311
Designed: MEM
Drawn: JDF
Checked: TPD
Approved: MEM
Sheet Title:

CART PATH
CENTERLINE CROSS
SECTIONS INCLUDING
DAM AND CHANNEL

Sheet Number:

C-5.0



MSD P# - P29963-00, BASEMAP 17N4



INTUITION
LOGIC
ILINC Engineering Incorporated
MO Certificate of Authority
2000152987
16253 Swingley Ridge Rd.
Suite 100
Chesterfield, MO 63017
Phone (636) 777-3000
Fax (314) 432-5812

Creve Coeur Dam and Channel
11400 Olde Cabin Road
Creve Coeur MO 63141
Creve Coeur, St Louis County, Missouri

THE PROFESSIONAL WHOSE SIGNATURE AND PERSONAL SEAL APPEAR HEREON, ASSUMES RESPONSIBILITY ONLY FOR WHAT APPEARS ON THIS PAGE, AND DISCLAIMS (PURSUANT TO SECTION 327 ALL RSMO) ANY RESPONSIBILITY FOR ALL OTHER PLANS, SPECIFICATIONS, ESTIMATES, REPORTS, OR OTHER DOCUMENTS OR INSTRUMENTS NOT SEALED BY THE UNDERSIGNED PROFESSIONAL RELATING TO OR INTENDED TO BE USED FOR ANY PART OR PARTS OF THE PROJECT TO WHICH THIS PAGE REFERS.

Professional Engineer Seal
Mark Edward Meyer - Engineer
MO# 2000150043

Expiration Date: Dec. 31, 2014

Rev	Date	Description
-	-	-
-	-	-
-	-	-
-	-	-

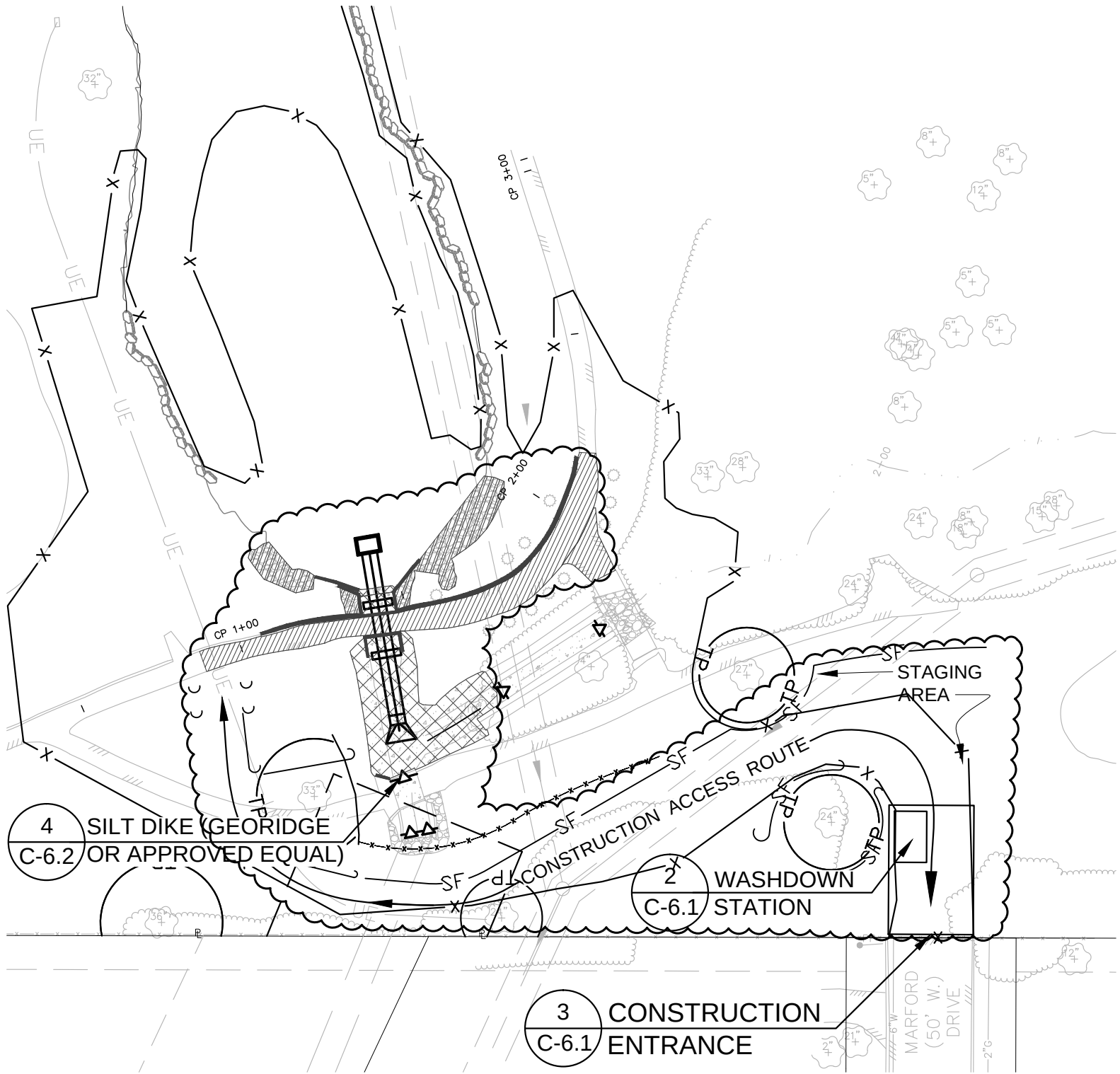
Project No. 1311
Designed: MEM
Drawn: JDF
Checked: TPD
Approved: MEM
Sheet Title:

PIPE CENTERLINE
CROSS SECTIONS

Sheet Number:

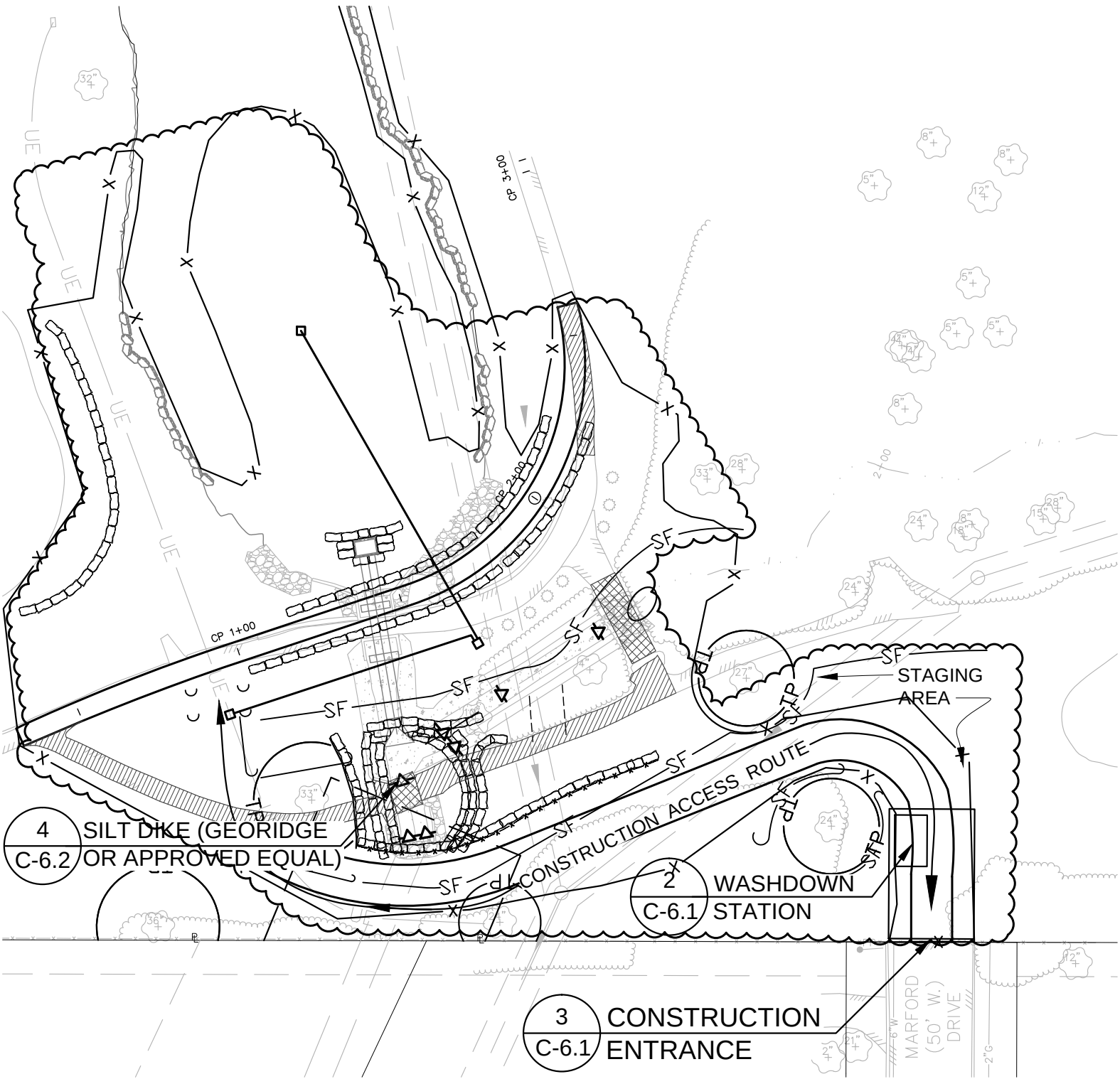
C-5.1

009_CREVE_COEUR_ESC



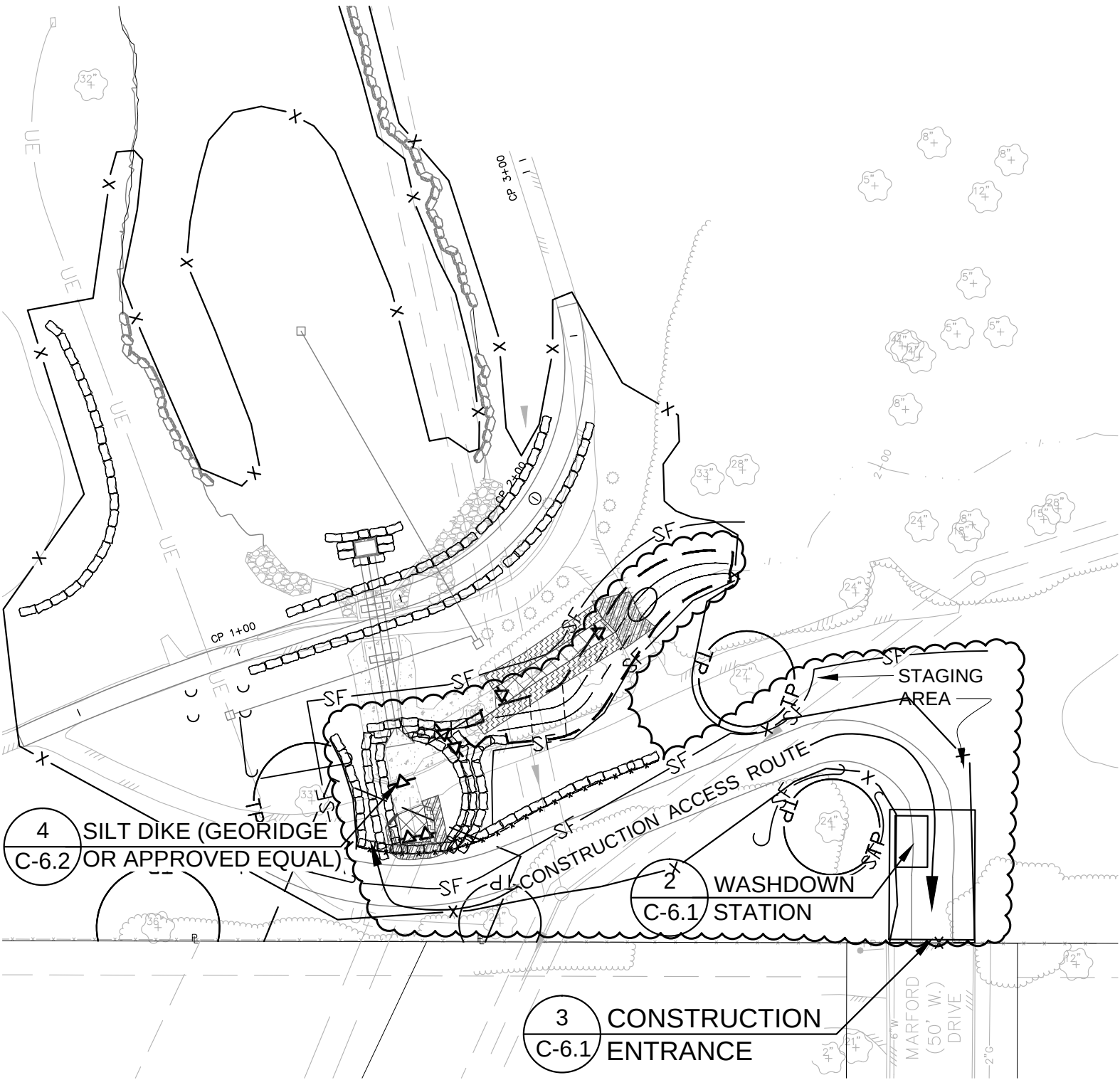
POSSIBLE PHASE 1

1. DEMOLISH PARTIAL CART PATH WITH WALL, CONCRETE SPILLWAY AND CONCRETE CHANNEL (STOPPING AT GABON CHANNEL)
2. DRAIN POND
3. EXCAVATE AND BENCH FOR CONDUIT
4. CONSTRUCT CONDUIT, RISER, AND SEEPAGE COLLARS
5. BACKFILL AND STABILIZE FILL SLOPE



POSSIBLE PHASE 2

1. DEMOLISH REMAINING CART PATH AND BRIDGES
2. DREDGE POND
3. CONSTRUCT VEGETATED ROCK SLOPE
4. CONSTRUCT NEW CART PATH
5. INSTALL PUMP DISCHARGE
6. INSTALL AUXILIARY POWER SUPPLY AND SOLAR BUBBLER

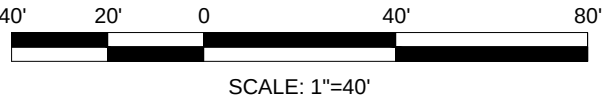


POSSIBLE PHASE 3

1. COMPLETE REMAINING DEMOLITION
2. CONSTRUCT EAST CHANNEL
3. STILLING BASIN AND LOWER CHANNEL CONSTRUCTION

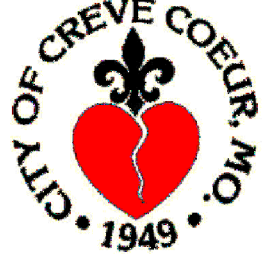
NOTES:

1. READ THE PROJECT SPECIFICATIONS AND SPECIAL PROVISIONS FOR DETAILS REGARDING EROSION AND SEDIMENT CONTROL.
2. THIS EROSION AND SEDIMENT CONTROL PLAN INDICATES SUGGESTED MEASURES FOR EROSION AND SEDIMENT CONTROL. CONTRACTOR IS NOT BOUND TO THIS PLAN BUT IS BOUND TO THE PROJECT SPECIFICATIONS AND SPECIAL PROVISIONS.
3. THE CONTRACTOR'S FINAL PHASED EROSION AND SEDIMENT CONTROL PLAN MUST BE APPROVED IN WRITING BY THE OWNER'S REPRESENTATIVE PRIOR TO THE BEGINNING OF CONSTRUCTION.
4. STOCKPILES SHALL BE STABILIZED OR COVERED AT THE END OF EACH WORKDAY.
5. SITE DISTURBANCE FOR PROPOSED IMPROVEMENTS AND OR STRUCTURES SHALL NOT BEGIN UNTIL ALL MATERIALS TO COMPLETE THE IMPROVEMENT AND OR STRUCTURE ARE ON SITE AND READY FOR INSTALLATION. SUCH IMPROVEMENTS AND OR STRUCTURES INCLUDE, BUT NOT LIMITED TO CULVERTS.
6. THERE SHALL BE NO DELAY BETWEEN EXCAVATION AND PLACING THE FINISHED MATERIAL FOR STRUCTURES ALONG THE LAKE OR ANY DRAINAGE CHANNEL. SUCH STRUCTURES INCLUDE, BUT ARE NOT LIMITED TO ROCK LINED CHANNELS, ROCK SLOPES, CULVERTS, HEADWALLS AND RETAINING WALLS. EXCAVATION FOR THESE STRUCTURES SHALL BEGIN ONLY IF THERE IS ENOUGH TIME IN THE WORKDAY TO FINISH PLACING THE MATERIAL. THESE STRUCTURES SHALL NOT BE LEFT UNFINISHED OVERNIGHT.
7. THE CONTRACTOR MAY PUMP GROUND WATER TO DITCHES FROM WORK AREAS DURING INSTALLATION OF SEWER AND DRAINAGE STRUCTURES. PRIOR TO PUMPING, ALL DITCH CHECKS AND EROSION CONTROL MEASURES SHALL BE INSPECTED AND DEEMED SUITABLE TO HANDLE THE CONCENTRATED FLOW VOLUMES FROM PUMPING. SUCH PUMPING AND DEWATERING IS CONSIDERED INCIDENTAL TO THE INSTALLATION OF EACH STRUCTURE.
8. WHEN DEWATERING EXCAVATIONS, THE CONTRACTOR SHALL NOT DISCHARGE MUDDY WATER.
9. THE SURFACE AREA OF ERODIBLE EARTH MATERIAL EXPOSED BY CONSTRUCTION ACTIVITIES SHALL BE LIMITED DURING CONSTRUCTION. THE CONTRACTOR MAY ONLY EXPOSE ERODIBLE EARTH MATERIAL IN ONE CONSTRUCTION AREA AT A TIME. GRADING, PLACEMENT OF FINAL STRUCTURES AND STABILIZATION MUST BE COMPLETE ON ONE CONSTRUCTION AREA BEFORE THE CONTRACTOR CAN BEGIN WORK ON ANOTHER CONSTRUCTION AREA. CONTRACTOR SHALL SPECIFY CONSTRUCTION AREAS IN THE EROSION AND SEDIMENT CONTROL PLAN SUBMITTED FOR APPROVAL.
10. CONTRACTOR SHALL INSTALL AND IMPLEMENT WASHDOWN STATIONS AT ALL CONSTRUCTION ACCESS POINTS TO PREVENT MUD, DIRT OR OTHER DEBRIS FROM BEING TRACKED UPON ANY SIDEWALKS OR STREETS OR OUTSIDE OF PROJECT LIMITS.
11. CONTRACTOR SHALL ALLOW ONLY RUBBER-TIRED EQUIPMENT ON THE SIDEWALKS OR STREETS.
12. WASHDOWN STATIONS AND STAGING AREAS SHALL BE PER ST. LOUIS COUNTY "SEDIMENT AND EROSION CONTROL STANDARDS".



LEGEND	
—SF—	SILT FENCE
—▲▲▲▲▲▲—	SILT DIKE
— — —	LIMITS OF DISTURBANCE
—TP—	TREE PROTECTION
—RP—	PRUNE TREE ROOTS
☁	ANTICIPATED WORK AREA
○	PUMP DISCHARGE

Path: P:\1311 - CREVE COEUR - Dam and Channel\CAD\plans
Plotted on: 8/4/14 @ 5:16 PM by ---

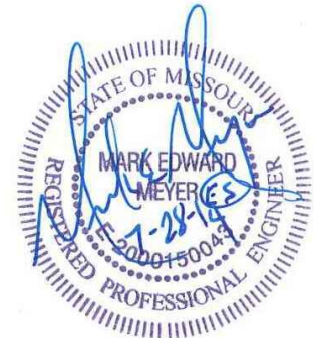


INTUITION
LOGIC
ILINC Engineering Incorporated
MO Certificate of Authority
2000152987
16253 Swingley Ridge Rd.
Suite 100
Chesterfield, MO 63017
Phone (636) 777-3000
Fax (314) 432-5812

Creve Coeur Dam and Channel
11400 Olde Cabin Road
Creve Coeur MO 63141
Creve Coeur, St Louis County, Missouri

THE PROFESSIONAL WHOSE SIGNATURE AND PERSONAL SEAL APPEAR HEREON, ASSUMES RESPONSIBILITY ONLY FOR WHAT APPEARS ON THIS PAGE, AND DISCLAIMS (PURSUANT TO SECTION 327 ALL RSMO) ANY RESPONSIBILITY FOR ALL OTHER PLANS, SPECIFICATIONS, ESTIMATES, REPORTS, OR OTHER DOCUMENTS OR INSTRUMENTS NOT SEALED BY THE UNDERSIGNED PROFESSIONAL RELATING TO OR INTENDED TO BE USED FOR ANY PART OR PARTS OF THE PROJECT TO WHICH THIS PAGE REFERS.

Professional Engineer Seal
Mark Edward Meyer - Engineer
MO# 2000150043



Expiration Date: Dec. 31, 2014

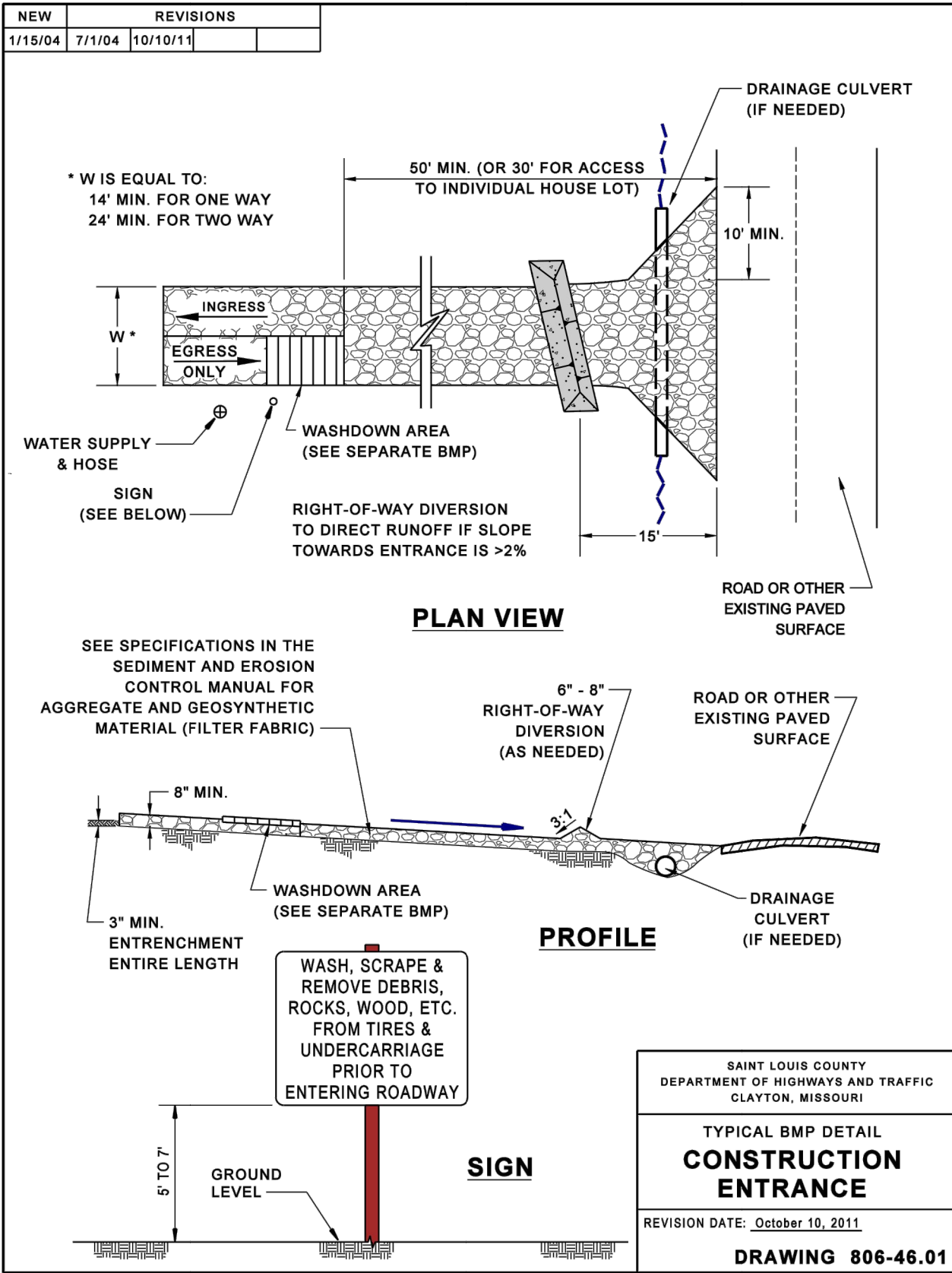
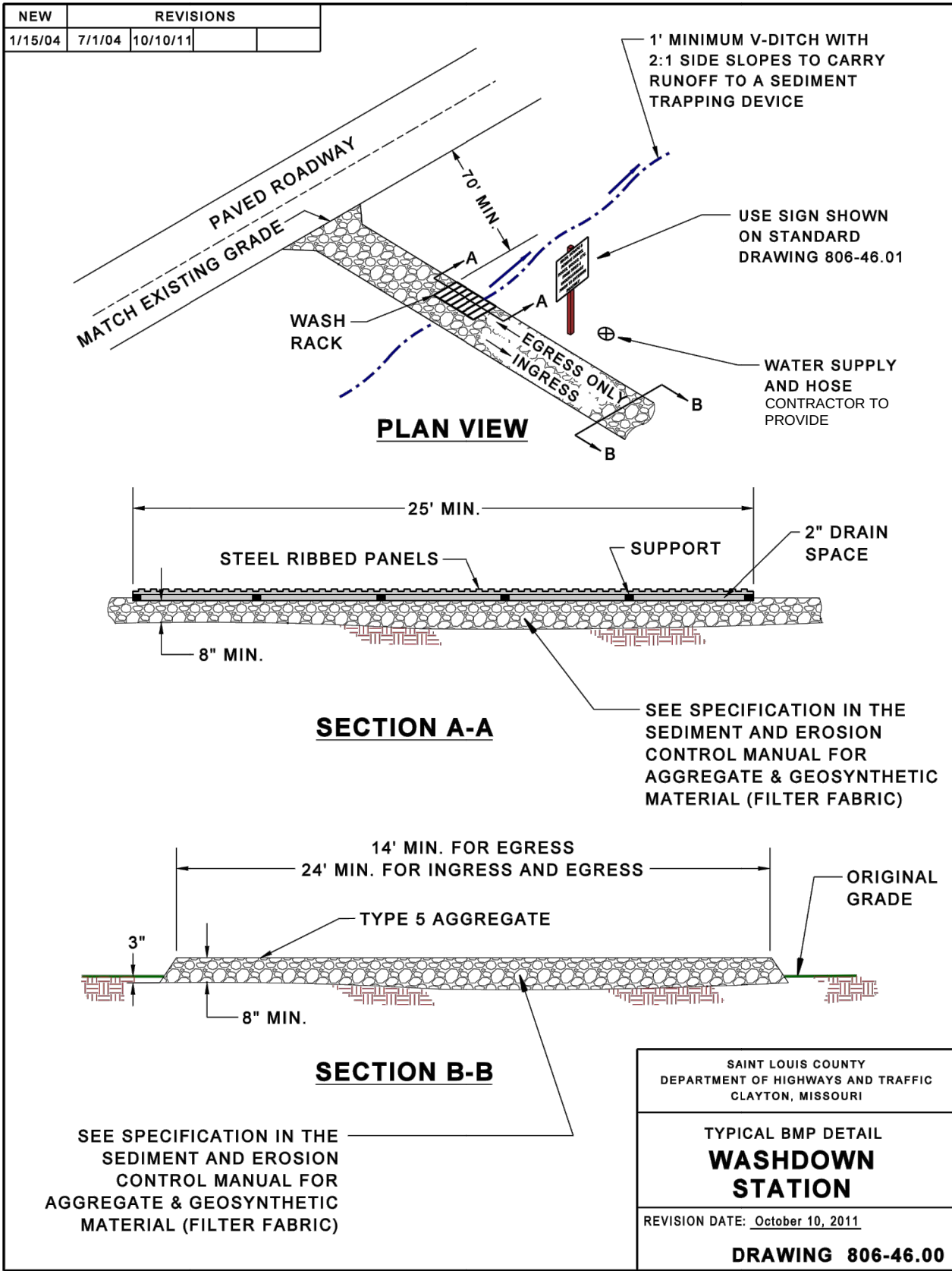
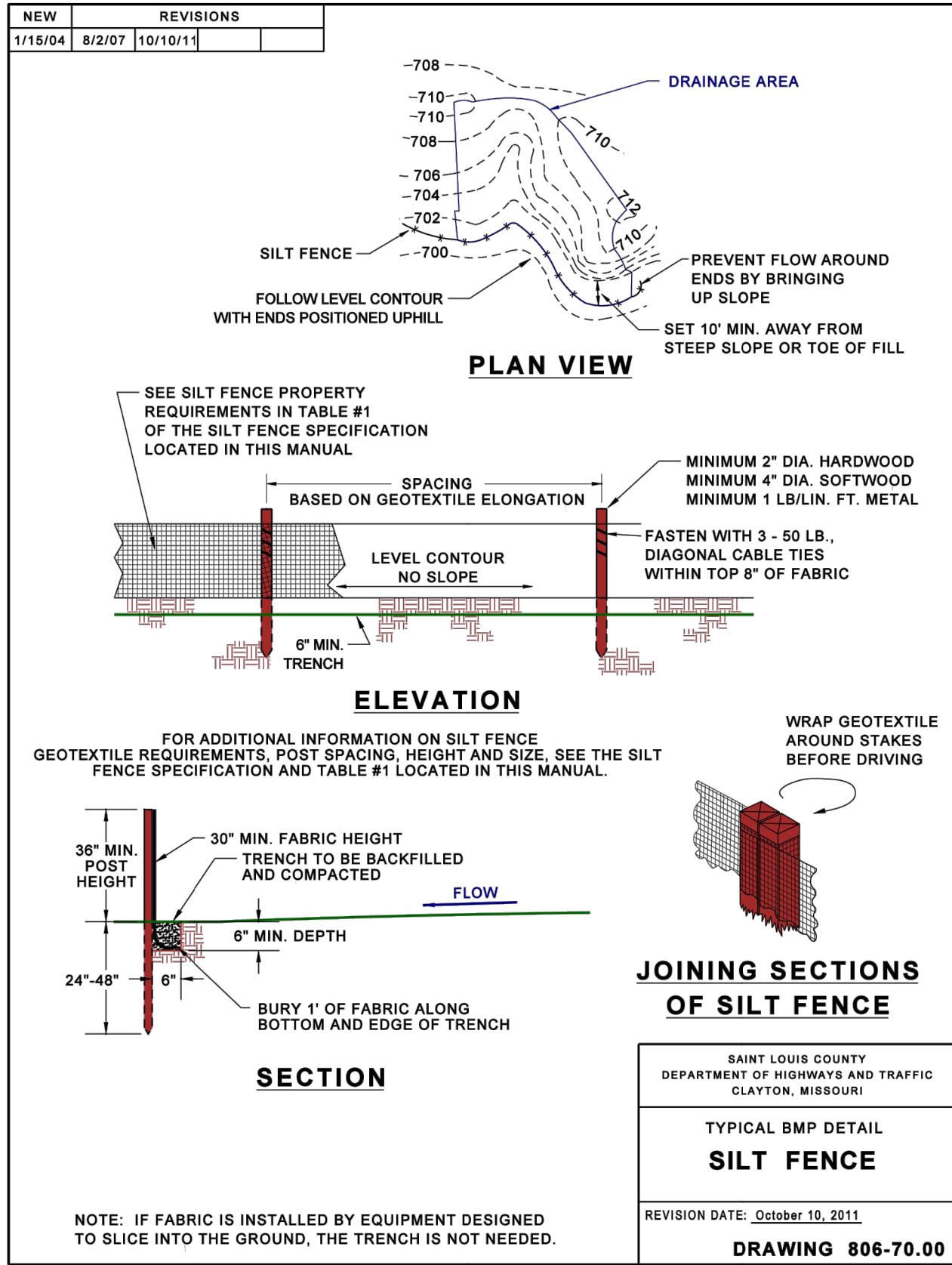
Rev	Date	Description
-	-	-
-	-	-
-	-	-
-	-	-

Project No. 1311
Designed: MEM
Drawn: JDF
Checked: TPD
Approved: MEM
Sheet Title:

EROSION AND
SEDIMENT CONTROL
PLAN

Sheet Number:

C-6.0



O&M PROCEDURES

- ✓ Inspect every week and after every storm.
- ✓ Remove sediment buildup deeper than ½ the fence height or 12", whichever is less.
- ✓ Replace torn or clogged fabric; repair loose fabric.
- ✓ Repair unstable or broken posts.
- ✓ Stabilize any areas susceptible to undermining.
- ✓ Extend fence or add additional row(s) of fence if necessary to provide adequate protection.

SITING AND DESIGN CONSIDERATIONS - The material for silt fences should be a pervious sheet of synthetic fabric such as polypropylene, nylon, and polyester or polyethylene yarn. Choose the material based on the minimum synthetic fabric requirements shown in **Table 1** below.

Table 1- Temporary Silt Fence Property Requirements

Physical Property	Test Method	Units	MARV Geotextile Requirements		
			Supported Silt Fence ²	Unsupported Silt Fence	
				Woven Elongation ≥ 50% ¹	Non-Woven Elongation ≤ 50% ¹
Post Spacing (Maximum)		feet	4	4	6
Height of Wire / Polymer Fence (Minimum)		inches	30	---	---
Grab Strength (Minimum): Machine Direction Cross Machine Direction	ASTM D 4632	pounds	90 90	125 100	125 100
Permittivity (Minimum)	ASTM D 4491	sec ⁻¹	0.05	0.05	0.05
Apparent Opening Size (AOS) ³	ASTM D 4751	Sieve Number	30	30	30
Ultraviolet Stability (Minimum) (retained strength)	ASTM D 4355		70% after 500 h of exposure		

Notes:

MARV Minimum Average Roll Value

¹ Elongation measured in accordance with ASTM D 4632

² **Silt Fence Support** - 14-gauge steel wire with a mesh spacing of 6 inches by 6 inches (or a prefabricated polymeric mesh of equivalent strength)

³ Maximum Average Roll Value

SITE CONDITIONS FOR REMOVAL - After permanent vegetation of slope is established. Remove fence and post, regrade trench area and vegetate.

TYPICAL DETAIL - 806-70.0

WASHDOWN STATION

PHYSICAL DESCRIPTION - An area located at construction entrances designed to wash sediment from the tires and undercarriage of exiting vehicles and prevent sediment from being tracked onto existing roadways.

WHERE BMP IS TO BE INSTALLED - Across or immediately adjacent to exit paths from unpaved construction sites.

CONDITIONS FOR EFFECTIVE USE OF BMP

Drainage: Downstream BMP sized to treat dirty runoff from washdown station

WHEN BMP IS TO BE INSTALLED - First order of work, along with construction entrance, prior to vehicles or equipment accessing unpaved areas.

INSTALLATION/CONSTRUCTION PROCEDURES

- ✓ Grade and compact area for drainage under washdown pad.
- ✓ Install steel-ribbed plate on frame or other support to allow a 2" drain space.
- ✓ Grade and vegetate downstream BMP (V-ditch shown on detail).
- ✓ Install water supply and hose.
- ✓ Post sign in advance of station indicating that all exiting vehicles and equipment must use station prior to exiting site.

O&M PROCEDURES:

- ✓ Remove sediment daily.
- ✓ Repair settled areas.
- ✓ Replace rock if necessary to maintain clean surface.

SITE CONDITIONS FOR REMOVAL - Remove when vehicles and equipment will no longer access unpaved areas.

TYPICAL DETAIL - 806-46.00

CONSTRUCTION ENTRANCE

PHYSICAL DESCRIPTION - A stabilized entrance to a construction site designed to minimize the amount of sediment tracked from the site on vehicles and equipment. Stabilization generally consists of aggregate over geogrid and geosynthetic material. Mud and sediment fall off of tires as they travel along the stabilized entrance; however, additional measures in the form of a washdown area should also be included on site. The stabilized entrance also distributes the axle load of vehicles over a larger area; thereby mitigating the rutting impact vehicles normally have on unpaved areas. See additional in the "Construction Site Access Requirements" section of this manual.

WHERE BMP IS TO BE INSTALLED - At locations where it is safe for construction vehicles and equipment to access existing streets – preferably at location of future streets or drives.

CONDITIONS FOR EFFECTIVE USE OF BMP

Drainage: Ditches or pipes, if needed, sized for 15 year, 20 minute storm; HGL 6" below surface of entrance

WHEN BMP IS TO BE INSTALLED - First order of work, along with washdown area, prior to vehicles or equipment accessing unpaved areas.

INSTALLATION / CONSTRUCTION PROCEDURES

- ✓ Grade and compact area of construction entrance.
- ✓ Install culvert under entrance if needed to maintain positive drainage.
- ✓ Place geosynthetic material next to compacted soil, lay geogrid on top of this, and cover with aggregate, forming diversion across entrance if needed to direct runoff away from roadway.
- ✓ See Washdown Station BMP for additional steps.

O&M PROCEDURES:

- ✓ Immediately remove any mud or debris tracked onto paved surfaces.
- ✓ Remove sediment and clods of dirt from construction entrance continuously.
- ✓ Replace rock if necessary to maintain clean surface.
- ✓ Repair settled areas.

SITE CONDITIONS FOR REMOVAL - Remove when vehicles and equipment will no longer access unpaved areas.

TYPICAL DETAIL - 806-46.01

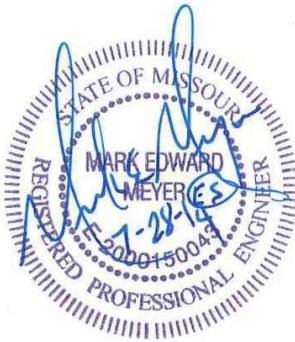


ILINC Engineering Incorporated
MO Certificate of Authority
2000152987
16253 Swingley Ridge Rd.
Suite 100
Chesterfield, MO 63017
Phone (636) 777-3000
Fax (314) 432-5812

Creve Coeur Dam and Channel
11400 Olde Cabin Road
Creve Coeur MO 63141
Creve Coeur, St Louis County, Missouri

THE PROFESSIONAL WHOSE SIGNATURE AND PERSONAL SEAL APPEAR HEREON, ASSUMES RESPONSIBILITY ONLY FOR WHAT APPEARS ON THIS PAGE, AND DISCLAIMS (PURSUANT TO SECTION 327.1 ALL RISK) ANY RESPONSIBILITY FOR ALL OTHER PLANS, SPECIFICATIONS, ESTIMATES, REPORTS, OR OTHER DOCUMENTS OR INSTRUMENTS NOT SIGNED BY THE UNDERSIGNED PROFESSIONAL RELATING TO OR INTENDED TO BE USED FOR ANY PART OR PARTS OF THE PROJECT TO WHICH THIS PAGE REFERS.

Professional Engineer Seal
Mark Edward Meyer - Engineer
MO# 2000150043



Expiration Date: Dec. 31, 2014

Rev	Date	Description
-	-	-
-	-	-
-	-	-
-	-	-

Project No. 1311
Designed: MEM
Drawn: JDF
Checked: TPD
Approved: MEM
Sheet Title:

EROSION AND
SEDIMENT CONTROL
DETAILS

Sheet Number:

C-6.1

Path: P:\1311 - CREVE COEUR - Dam and Channel\CAO\Plans
Plotted on: 8/4/14 @ 5:16 PM by -----

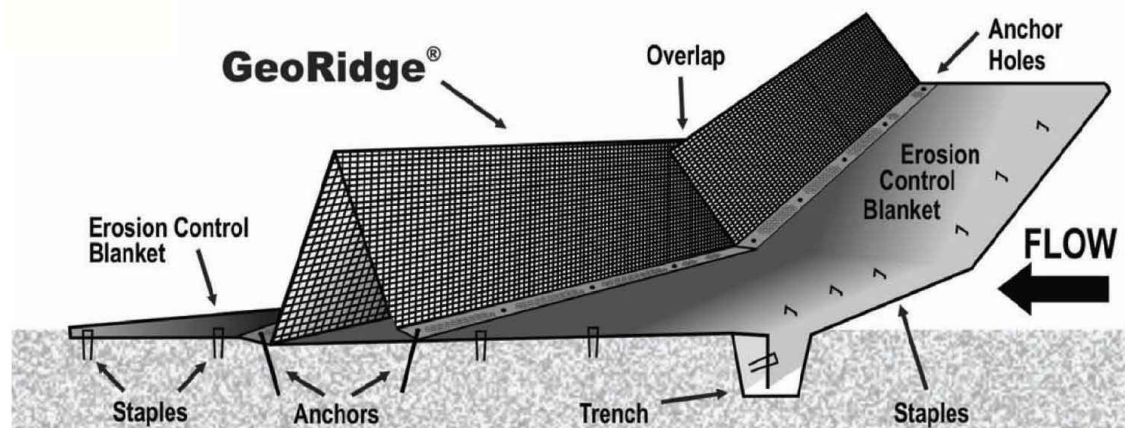
009_CREVE_COEUR_ESC



GeoRidge® & GeoRidge Bio®

INSTALLATION GUIDELINES

GeoRidge® & GeoRidge Bio®

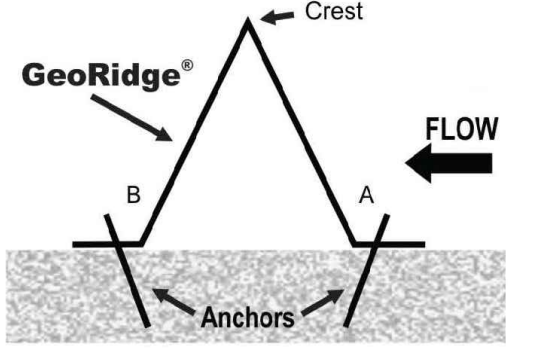


Select an erosion control blanket (ECB) grade based on the channel geometry and flow conditions. Follow manufacturer's recommended installation procedures.

Installation Instructions

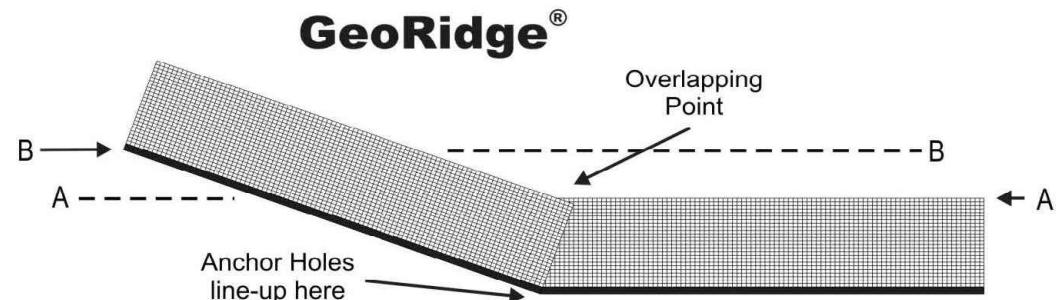
Step 1: A section of ECB shall be placed across the flowline direction of the channel prior to the installation of the GeoRidge. The ECB section must span the entire width of the channel, while the width of the blanket must be at least one roll width or no less than 1.22 m (4 ft).

Step 2: The upstream edge of the ECB must be secured in a 100 mm 4" trench. Secure the blanket in the trench using 150mm or 6" minimum staples placed at 500 mm (1.67 ft) intervals along the edge. Backfill and re-compact the soil in the upstream edge trench.



Minimum 3 anchors on the upstream side (A) and 2 anchors on the downstream side (B)

Step 3: Secure the downstream edge of the blanket with 150 mm or 6" minimum staples placed at 300 mm (1 ft) intervals along the edge.



When installing GeoRidge ensure that point B is equal to or higher than point A. This will prevent water from flowing around sides of the GeoRidge mounted on the channel embankment.

Step 4: Place the GeoRidge berm in the middle of the ECB and anchor with 10" spiral spikes. Anchor spacing depends on soil condition and density. Minimum recommendation is 3 anchors on the upstream side and 2 anchors on the downstream side. The anchors will prevent water from going around or under the GeoRidge.

Note: If multiple GeoRidge panels are required to span a channel, ensure that the anchor holes line-up when you overlap each panel (see diagram above).



Minimum 3 anchors on the upstream side (A) and 2 anchors on the downstream side (B)

Example: On a 2% gradient, 0.230 m (height of GeoRidge)/ 0.02 gradient = 11.5 m spacing.



EROSION AND SEDIMENT CONTROL

nilex.com

EDMONTON | CALGARY | TORONTO | VANCOUVER | VERNON | ADDYSTON | PRINCE GEORGE | SASKATOON | DENVER

REV:0000

CHECK DAM

PHYSICAL DESCRIPTION - A small dam built within a drainage swale or temporary diversion channel designed to pond water and cause sediment to settle out. Dams can be constructed of rock, sand bags, filter rolls / wattles, triangular dikes, or gravel bags. Silt fence shall not be used to construct check dams.

WHERE BMP IS TO BE INSTALLED - At intervals along drainage swales or channels. The top of the downstream check dam should be level with the base of the upstream check dam.

CONDITIONS FOR EFFECTIVE USE OF BMP

Type of Flow:	Moderate concentrated flow
Contributing Area:	Maximum of 2 acres
Channel Slope:	Maximum of 2%

WHEN BMP IS TO BE INSTALLED - Prior to disturbance of natural vegetation in contributing drainage area; immediately after construction of drainage way.

For additional information see Section 806.30 of St. Louis County's Standard Specification for Highway Construction.

INSTALLATION / CONSTRUCTION PROCEDURES

- ✓ Grade drainage way and compact area of check dam.
- ✓ Place rock, sand bags, filter rolls / wattles or gravel bags to required configuration perpendicular to flow.

O&M PROCEDURES

- ✓ Inspect every week and after every storm.
- ✓ Remove trash and leaf accumulation.
- ✓ Remove sediment buildup once it reaches ½ depth of check dam or 12" depth, whichever is less.
- ✓ Restore dam structure to original configuration to protect banks.
- ✓ Replace rock on upstream face of dam if ponding does not drain in reasonable timeframe.

SITE CONDITIONS FOR REMOVAL - Remove after contributing drainage areas have been adequately stabilized and vegetation is adequately established in drainage way. Regrade and vegetate area of check dam.

TYPICAL DETAIL - 806-35.00

10/10/2011

Page 60

Sediment and Erosion Control Manual

NTS



The Pump-It Tube® Patent Pending

The Pump-It Tube is ideal for removing sediment when dewatering collection ponds, sumps, and more.

- Attaches easily to pipes and hoses with a Velcro strip (included), simple pipe clamp or heavy zip tie (not included)
- High Flow Grey Material allows 192 gal/ft²/min
- Reusable-After use; clean by spraying out sediment
- Also available in custom sizes depending on amount of discharge
- High strength stitching to minimize high pressure blowouts
- Velcro handles sewn along the length of tube to aide in mobility
- Includes inside strap for Bio-Star flocc pouches

The Pumpit Tube® Specifications

Minimum Average Fabric Values

Properties

Mass per Unit Area (oz/yd ²)	D-3776	5.2
Grab Tensile Strength, MD x CD (lbs)	D 4632	297 x 223
Grab Elongation, MD x CD (%)	D 4632	58 / 59
Trapezoid Tear, MD x CD (lbs)	D 4533	81 x 75
Puncture (lbs)	D 4833	99
Burst Strength (psi)	D 3786	340
Permittivity (sec-1)	D 4491	2.60
A.O.S. (U.S. sieve - (mm)	D 4751	60
Water Flow Rate (gpm/ft ²)	D-4491	192

ASTM TEST

Value

D-3776	5.2
D 4632	297 x 223
D 4632	58 / 59
D 4533	81 x 75
D 4833	99
D 3786	340
D 4491	2.60
D 4751	60
D-4491	192

DEWATERING

PHYSICAL DESCRIPTION - Dewatering Operations are practices that manage the discharge of pollutants when non-storm water and accumulated precipitation (storm water) must be removed from a work location so that construction work or utility installation may be accomplished. The contractor / permittee is responsible for insuring this provision is adhered to by all workers, utility companies, sub-contractors, etc. on any land disturbance site.

WHERE BMP IS TO BE INSTALLED

- Non-storm water includes, but is not limited to, groundwater, dewatering of piles, water from coffer dams, water diversions, and water used during construction activities that must be removed from a work area.
- Practices identified in this section are also appropriate for implementation when managing the removal of accumulated precipitation (storm water) from depressed areas at a construction site or utility excavation.
- Storm water mixed with non-storm water should be managed as non-storm water.
- Site conditions will dictate design and use of dewatering operations.
- The controls discussed in this BMP address sediment only. If the presence of polluted water with hazardous substances is identified by smell or sight (sheen), the contractor shall notify the Resident Engineer (RE) to discuss the applicable course of remediation action on County projects.
- Accumulated sediment that is commingled with other pollutants must be disposed of in accordance with all applicable laws and regulations.
- Avoid dewatering discharges where possible by using the water for dust control, by infiltration, etc.
- Sediment control and other appropriate BMP's (e.g., outlet protection / energy dissipation) must be employed when water is discharged. Dewatering discharges must not cause erosion at the discharge point. The discharge of murky, turbid, untreated dewatering operations water to a storm sewer or other water body is prohibited.
- The dewatering discharge shall not exceed a Total Settleable Solids limit of 0.5 mL/hr if the discharge is within the prescribed proximity of a "Valuable Resource Water" as defined by the Missouri Department of Natural Resources. Dewatering discharge shall not exceed a Total Settleable Solids limit of 2.5 mL/hr to any other outfall.
- Additional permits or permissions from other agencies may be required for dewatering.
- The anticipated volume of water to be discharged and the anticipated maximum flow discharged from dewatering activities expressed in gallons per minute, shall be provided and coordinated with the type and capacity of equipment being used for dewatering.
- In no case shall water be pumped off site without being treated.

- A variety of methods can be used to treat water during dewatering operations from the construction site or utility excavation. Several devices are presented in this section that provides options to achieve sediment removal. The size of particles present in the sediment or receiving water limitations on sediment are key considerations for selecting sediment treatment option(s); in some cases, the use of multiple devices may be appropriate. A few of the methods include but are not limited to:

- 1) Sediment / De-silting Basin.
- 2) Sediment Trap.
- 3) Mobile Settling Technologies - Weir Tank, Dewatering Tank.
- 4) Gravity Bag Filter.
- 5) Sand Media Particulate Filter.
- 6) Pressurized Bag Filter.
- 7) Cartridge Filter.

CONCRETE WASTE MANAGEMENT

DESCRIPTION - The purpose of this specification is to set forth procedures and practices designed to eliminate the discharge of concrete waste materials to storm drainage systems, drainage areas, streets or watercourses, which shall be required of the contractor.

APPROPRIATE APPLICATION OF BMP - Concrete waste management procedures and practices will be implemented on construction projects as follows:

- Where concrete is used as a construction material or where concrete dust and debris result from demolition activities.
- Where slurries containing Portland cement concrete (PCC), asphaltic concrete (AC) or bituminous concrete (BC) are generated, such as from saw cutting, coring, grinding, grooving and hydro-concrete demolition.
- Where concrete trucks and other concrete-coated equipment are washed on-site, when approved by the Resident Engineer or Construction Inspector.
- Where mortar-mixing station exist.

AWARENESS / ENFORCEMENT

- Contractor's and / or permit holder's superintendent or representative shall oversee and enforce concrete waste management procedures.
 - Discuss the concrete management techniques described in this BMP (such as handling of concrete waste and washout) with the ready-mix concrete supplier before any deliveries are made.
- The site superintendent shall make drivers aware of the presence of the concrete waste management facilities. The site superintendent should post signage indicating the location and designated use of the concrete waste management areas, and provide careful oversight to inspect for evidence of improper dumping of concrete waste and wash water.

IMPLEMENTATION

- Contractors, private individuals, public agencies, etc. using concrete material, shall incorporate requirements for concrete waste management into material supplier and subcontractor agreements. Include requirements in contracts with concrete delivery companies that drivers must use designated concrete washout facilities.
- Store dry and wet materials under cover, away from drainage areas.
- Avoid mixing excess amounts of fresh concrete.
- Do not allow excess concrete to be dumped on-site, except in designated areas.
- Cover the structures before predicted rainstorms to prevent overflows.
- Monitor on site concrete waste storage and disposal procedures at least weekly or as directed by the Resident Engineer or Construction Inspector.

- In St. Louis County, the contractor is required by Missouri State Law (10 CSR 10-6.170) and County Ordinance (612.340) to control fugitive dust blown from the construction site, signal installation, etc. Dust control, including saw-cut material etc., on the construction site shall be monitored for safety purposes and to prevent nuisances. The contractor / permittee shall apply reasonable measures to control dust and particulate matter (of any size or source) due to roadway / construction traffic, grading, clearing and grubbing, building demolition, saw-cutting etc. from migrating off the site of origin. Operations residue from grinding, saw-cutting etc. should be picked up (cleaned-up) by means of a vacuum device or swept up. Compressed or blown air may be used to clean negligible residual dust that the vacuum or sweeping did not clean up, as long as the above dust control procedures (and law and ordinance) are met. Saw cutting residue, slurry or dry, should not be allowed to enter storm drains or watercourses. Saw cutting residue should not be allowed to flow across the pavement and should not be left on the surface of the pavement when traffic is present, when precipitation is anticipated before cleanup or overnight. In approved locations, saw-cut slurry may flow into the dirt (where it can soak into the ground) adjacent to the saw-cutting operation and be buried, on site, 2' minimum below finished grade. Other dust control and clean-up procedures may be acceptable as approved by the Engineer or St. Louis County. See additional Concrete Waste Management requirements in this Manual.

WASHOUT AREA PROTOCOL

- Contain concrete washout on site or take it offsite for disposal in designated areas only.
- Do not wash out concrete trucks into storm drains, open ditches, streets, or streams.
- For onsite washout:
 - Locate washout area on-site at least 50 feet from storm drains, open ditches, or water bodies. Do not allow runoff from this area by constructing a temporary pit or bermed area large enough to contain liquid and solid waste. Locate it in a dirt area where the liquid portion of the washout can soak into the ground. They are preferably built below-grade to prevent breaches and reduce the likelihood of runoff. Discontinue use of the washout once it reaches 75% capacity. Washouts should be sized to handle solids and wash water to prevent overflow. It is estimated that 7 gallons of wash water are used to wash one truck chute and 50 gallons are used to wash out the hopper of a concrete pump. Implement a maintenance schedule for washout areas.
 - Temporary washout facilities should have pit or bermed areas of sufficient volume to completely contain all liquid and waste concrete materials generated during washout procedures.
 - Wash out wastes into the pit where the concrete can set, be broken up, and used on site; or buried on site; or disposed of properly.
- Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stockpile or dispose of in the trash.
- Do not place concrete wash water in a pit that is connected to the storm drain system or that drains to nearby waterways.

- Locate concrete washout facilities in an area that allows convenient access for concrete trucks, preferably near the area where the concrete is being poured. Appropriate gravel or rock should cover paths to concrete washout facilities if the facilities are located on undeveloped property. These areas should be far enough away from other construction traffic to reduce the likelihood of accidental damage and spills. The number of facilities you install should depend on the expected demand for storage capacity. On large sites with extensive concrete work, place washouts in multiple locations for ease of use. If the dried concrete washout is buried on the site it shall have a 2-foot cover minimum. The 2-foot cover shall match with surrounding finished grade.
- Concrete washed out in areas other than those designated for such activity, shall be cleaned up by the contractor.
- Install signage adjacent to each washout facility to inform concrete equipment operators to utilize the proper facilities.
- Perform washout of concrete mixers, delivery trucks and other delivery systems in designated areas only.
- Wash out concrete from concrete pumper bins into concrete pumper trucks and discharge into designated washout area.
- Equipment that cannot be easily moved, such as concrete pavers, shall only be washed in designated areas that do not drain to waterways or storm drain systems.
- Backfill and repair holes, depressions or other ground disturbance caused by the removal of the temporary concrete washout facilities.
- Wash out concrete on site into a future designated final concrete pour location. This location cannot be within 50 feet of a storm or sanitary sewer; or water course; or where it can drain off site. The washout cannot jeopardize the integrity of the final concrete pour. Concrete to be removed from the site shall be disposed of in conformance with the provisions in Standard Specification Manual, Section 202, all as directed by the Engineer. No additional payment will be made for complying with the above specification.
- A self-contained and watertight container may be used to control, capture, and contain concrete wastewater and wash-out material. The container must be portable and temporary, damage resistant, protect against spills and leaks, and sized to handle solids and wash water to prevent overflow. The container should be emptied and cleaned when 75% of its capacity is reached. After all liquids evaporate or are pumped or vacuumed, and the remaining slurry solidified, the Contractor may bury the solids on site. On County Highway Projects the solids may be buried on site if approved by the Engineer. In either case, solids shall be buried a minimum of 2 feet below finished grade. Disposal of container contents that are removed from the site shall be made at an approved landfill. In order to prevent overflows caused by natural occurrences and to provide security for safety purposes and against acts of vandalism, the container shall be covered at the end of each workday and remain covered until the beginning of the next workday. The cover shall remain on site with the container at all times. Container shall be free of liquids during any on-site relocation process or transport to another site. On County Highway projects, location(s) for the container shall be approved by the Engineer.

TYPICAL DETAIL - 806-46.03

CONCRETE WASTE MANAGEMENT

NTS

MSD P# - P29963-00, BASEMAP 17N4

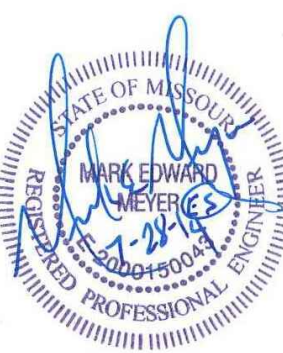


ILINC Engineering Incorporated
MO Certificate of Authority
2000152987
16253 Swingley Ridge Rd.
Suite 100
Chesterfield, MO 63017
Phone (636) 777-3000
Fax (314) 432-5812

Creve Coeur Dam and Channel
11400 Olde Cabin Road
Creve Coeur MO 63141
Creve Coeur, St Louis County, Missouri

THE PROFESSIONAL WHOSE SIGNATURE AND PERSONAL SEAL APPEAR HEREON, ASSUMES RESPONSIBILITY ONLY FOR WHAT APPEARS ON THIS PAGE, AND DISCLAIMS (PURSUANT TO SECTION 327 ALL RISK) ANY RESPONSIBILITY FOR ALL OTHER PLANS, SPECIFICATIONS, ESTIMATES, REPORTS, OR OTHER DOCUMENTS OR INSTRUMENTS NOT SEALED BY THE UNDERSIGNED PROFESSIONAL RELATING TO OR INTENDED TO BE USED FOR ANY PART OR PARTS OF THE PROJECT TO WHICH THIS PAGE REFERS.

Professional Engineer Seal
Mark Edward Meyer - Engineer
MO# 2000150043



Expiration Date: Dec. 31, 2014

Rev	Date	Description
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-

Project No. 1311

Designed: MEM

Drawn: JDF

Checked: TPD

Approved: MEM

Sheet Title:

EROSION AND
SEDIMENT CONTROL
DETAILS

Sheet Number:

C-6.2

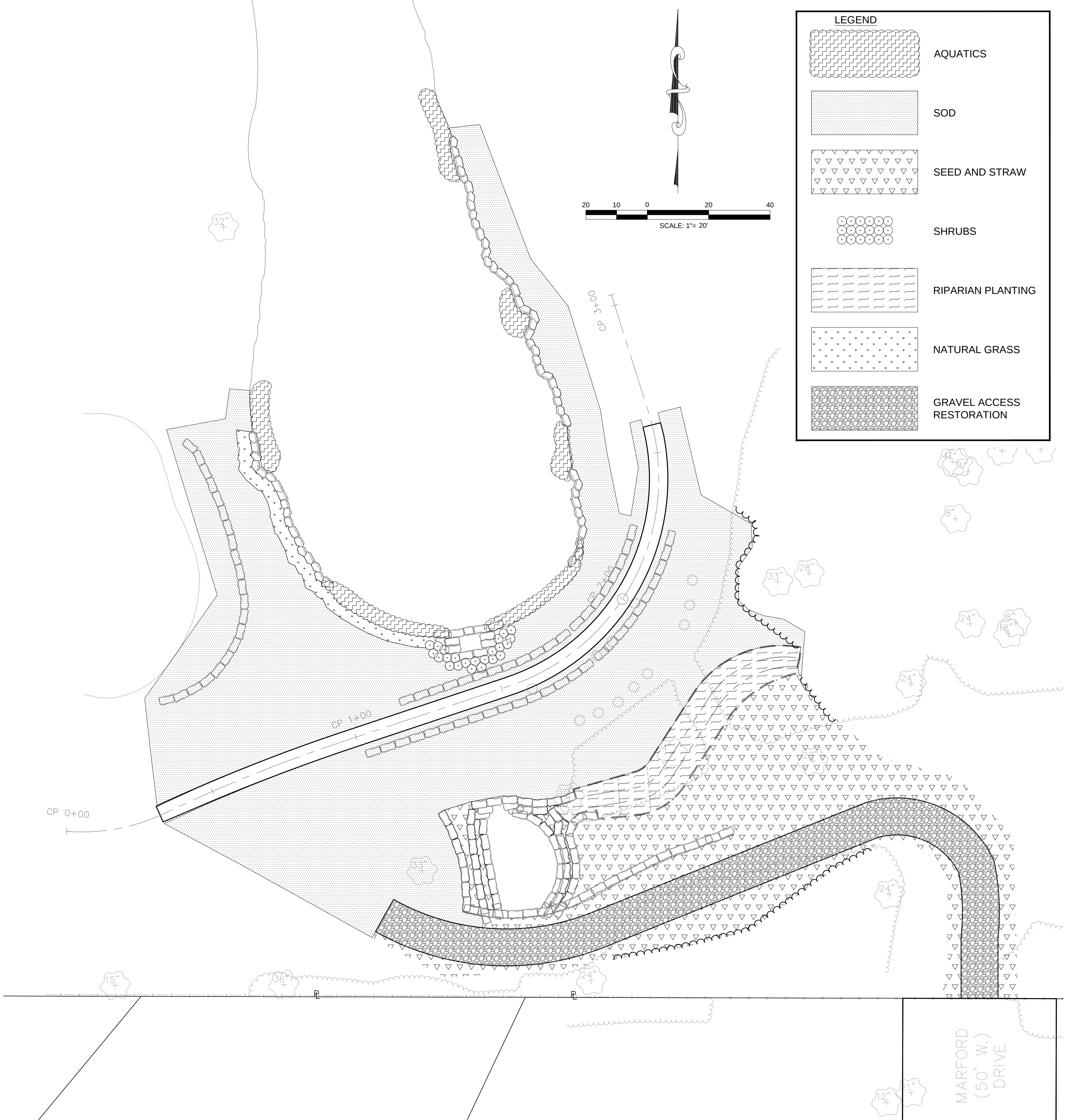
Riparian Planting					
Quantity	Scientific Name	Common Name	Form	Spacing on Center (ft)	Comments
68	<i>Cornus obliqua</i>	Silky dogwood	4ft livestake	2	Plant in all elevations
51	<i>Cornus sericea</i>	Redosier dogwood	4ft livestake	2	Plant in lower half
68	<i>Physocarpus opulifolius</i>	Ninebark	4ft livestake	2	Plant in upper half
17	<i>Salix amygdaloides</i>	Peach Leaved Willow	4ft livestake	2	Plant in lower half
17	<i>Salix nigra</i>	Black willow	4ft livestake	2	Plant in lower half
51	<i>Populus deltoides</i>	Eastern cottonwood	4ft livestake	2	Plant in all elevations
68	<i>Sambucus canadensis</i>	Elderberry	4ft livestake	2	Plant in all elevations
187	TOTAL				

Native Grass				Seeding Rate	
	Scientific Name	Common Name	Form		
	<i>Buchloe dactyloides</i>	buffalo grass	PLS	110 lbs/acre	

Aquatics					
Quantity	Scientific Name	Common Name	Form	Spacing on Center (ft)	COMMENTS
45	<i>Sagittaria latifolia</i>	broad leaf arrowhead	1 gallon containerized	2	plant throughout outer two-thirds of
45	<i>Pontederia cordata</i>	pickerel weed	1 gallon containerized	2	plant throughout outer two-thirds of
16	<i>Iris virginica</i>	blue flag iris	1 gallon containerized	2	plant throughout inner third of shelf
18	<i>Iris fulva</i>	copper iris	1 gallon containerized	2	plant throughout inner third of shelf
18	<i>Lobelia cardenalis</i>	cardinal flower	1 gallon containerized	2	plant throughout inner third of shelf
16	<i>Lobelia siphilitica</i>	blue lobelia	1 gallon containerized	2	plant throughout inner third of shelf
22	<i>Schoenoplectus tabernaemontani</i>	softstem bulrush	1 gallon containerized	2.5	plant throughout outer half of shelf
22	<i>Eleocharis palustris</i>	spikerush	1 gallon containerized	2.5	plant throughout outer half of shelf
202	TOTAL				

Shrubs					
Quantity	Scientific Name	Common Name	Form	Spacing on Center (ft)	Comments
12	<i>Cornus sericea</i>	red osier dogwood	5 gallon containerized	3	plant where indicated
5	<i>Cephalanthus occidentalis</i>	buttonbush	5 gallon containerized	3	plant where indicated
6	<i>Hibiscus moscheutos</i>	hibiscus 'Giant Maroon'	5 gallon containerized	3	plant where indicated

Sod			
Quantity	Scientific name	Common Name	Form
1,077 sq yds	<i>Festuca spp.</i>	Turf type tall fescue sod	rolled sod
Seed & Straw			
552 sq yds	St. Louis County Seed and Straw		PLS
Gravel Access Restoration			
420 sq yds	Gravel access road restoration		

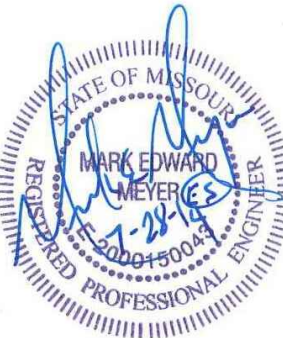


ILINC Engineering Incorporated
MO Certificate of Authority
2000152987
16253 Swingley Ridge Rd.
Suite 100
Chesterfield, MO 63017
Phone (636) 777-3000
Fax (314) 432-5812

Creve Coeur Dam and Channel
11400 Olde Cabin Road
Creve Coeur MO 63141
Creve Coeur, St Louis County, Missouri

THE PROFESSIONAL WHOSE SIGNATURE AND PERSONAL SEAL APPEAR HEREON, ASSUMES RESPONSIBILITY ONLY FOR WHAT APPEARS ON THIS PAGE, AND DISCLAIMS (PURSUANT TO SECTION 327 ALL RSMO) ANY RESPONSIBILITY FOR ALL OTHER PLANS, SPECIFICATIONS, ESTIMATES, REPORTS, OR OTHER DOCUMENTS OR INSTRUMENTS NOT SEALED BY THE UNDERSIGNED PROFESSIONAL RELATING TO OR INTENDED TO BE USED FOR ANY PART OR PARTS OF THE PROJECT TO WHICH THIS PAGE REFERS.

Professional Engineer Seal
Mark Edward Meyer - Engineer
MO# 2000150043



Expiration Date: Dec. 31, 2014

Rev	Date	Description
-	-	-
-	-	-
-	-	-
-	-	-

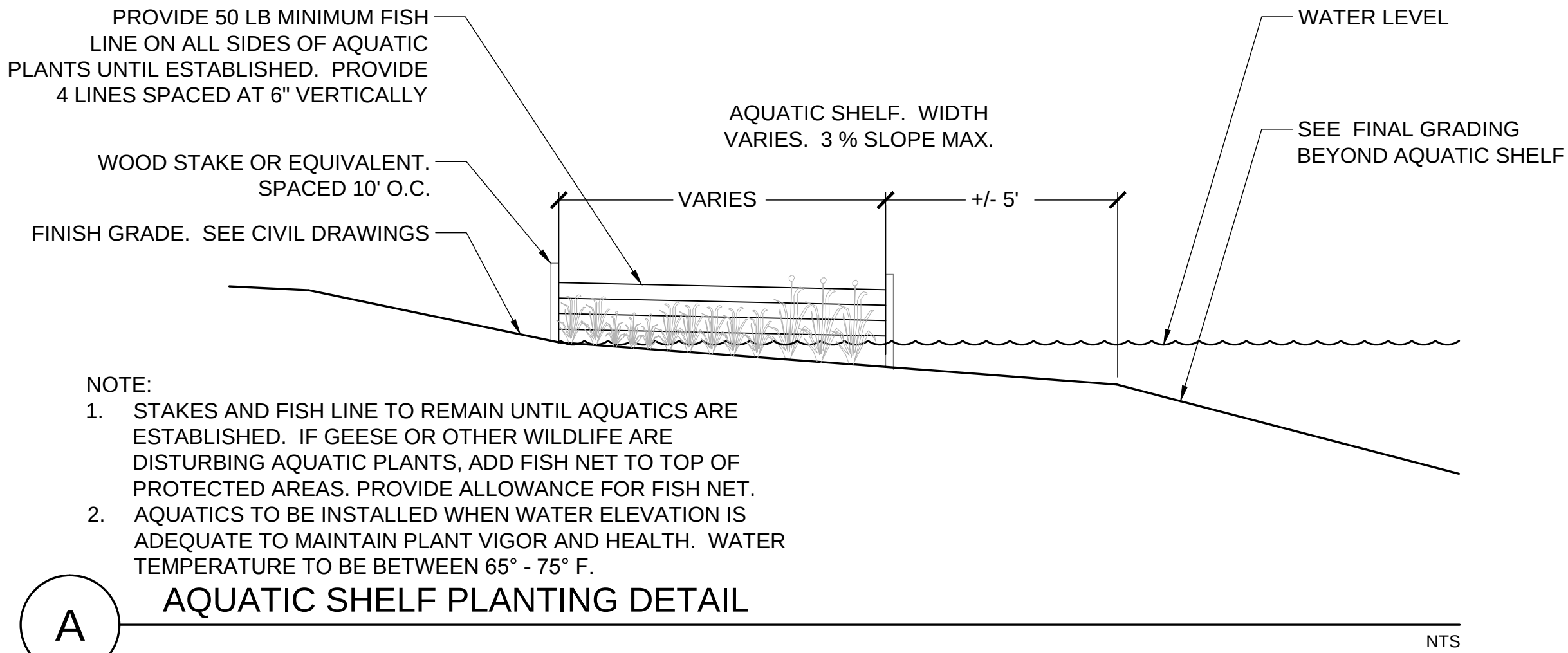
Project No. 1311
Designed: MEM
Drawn: JDF
Checked: TPD
Approved: MEM
Sheet Title:

PLANTING PLAN

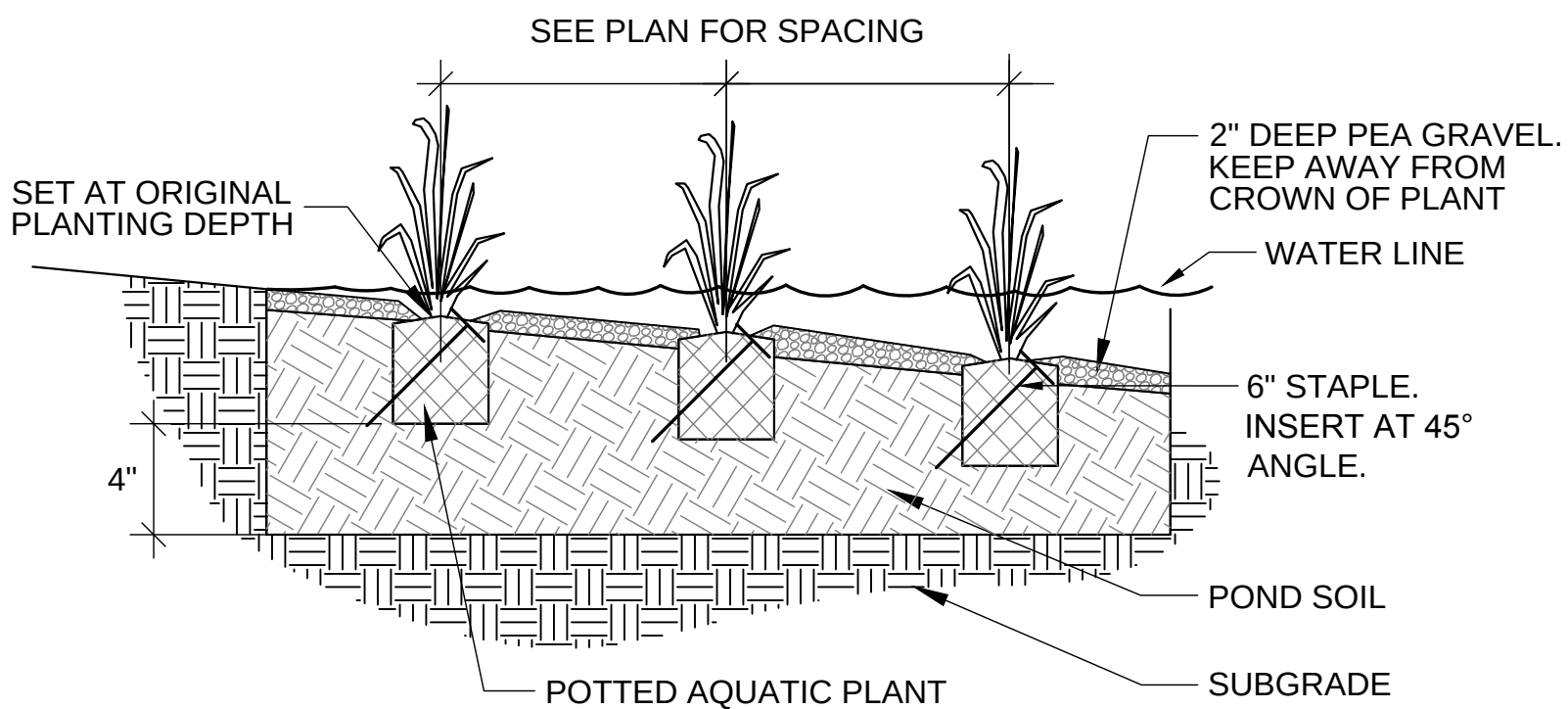
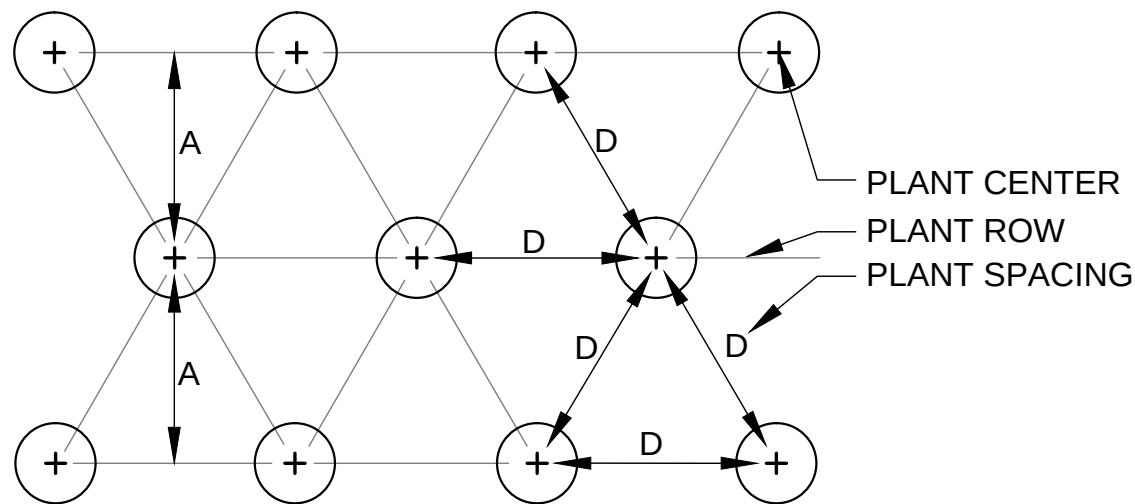
Sheet Number:

C-7.0

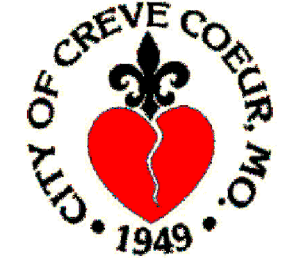
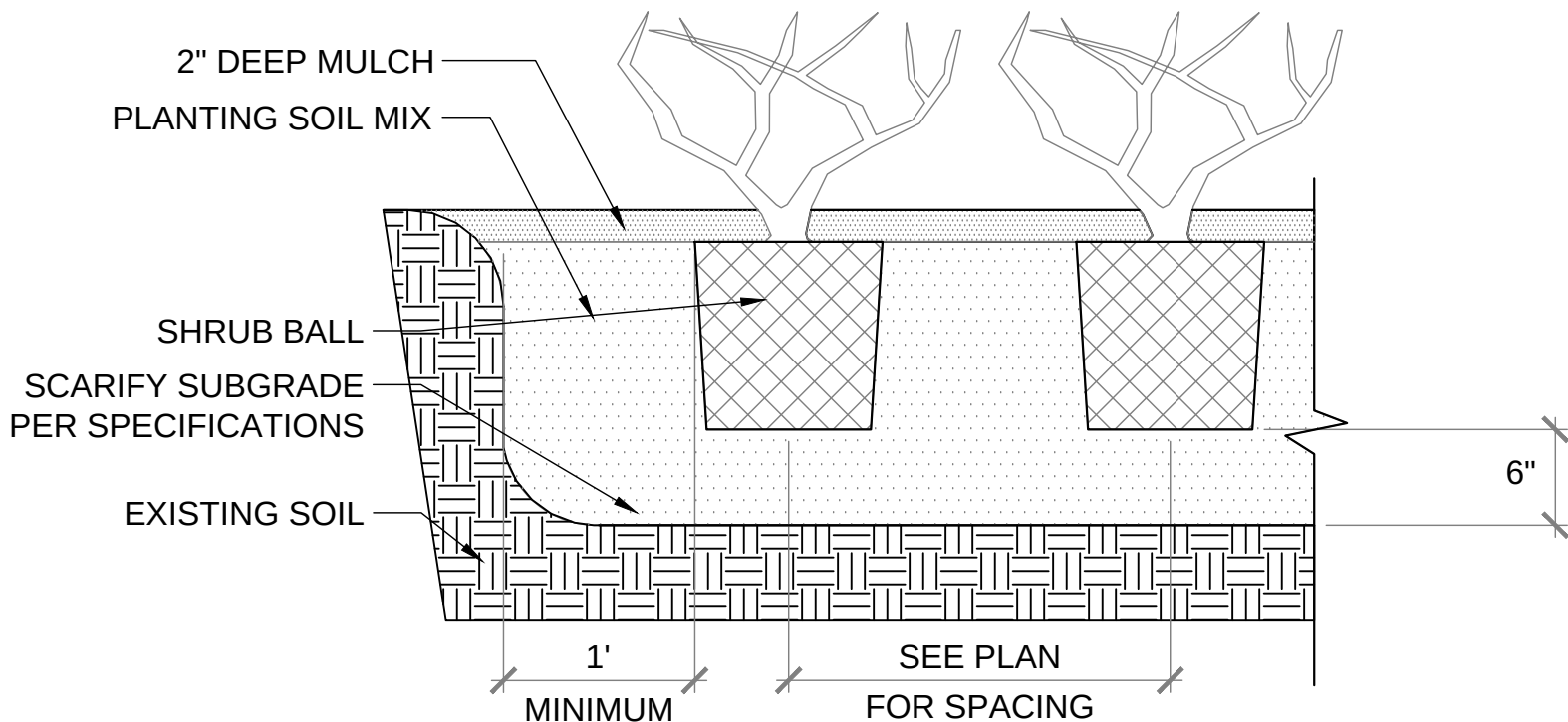
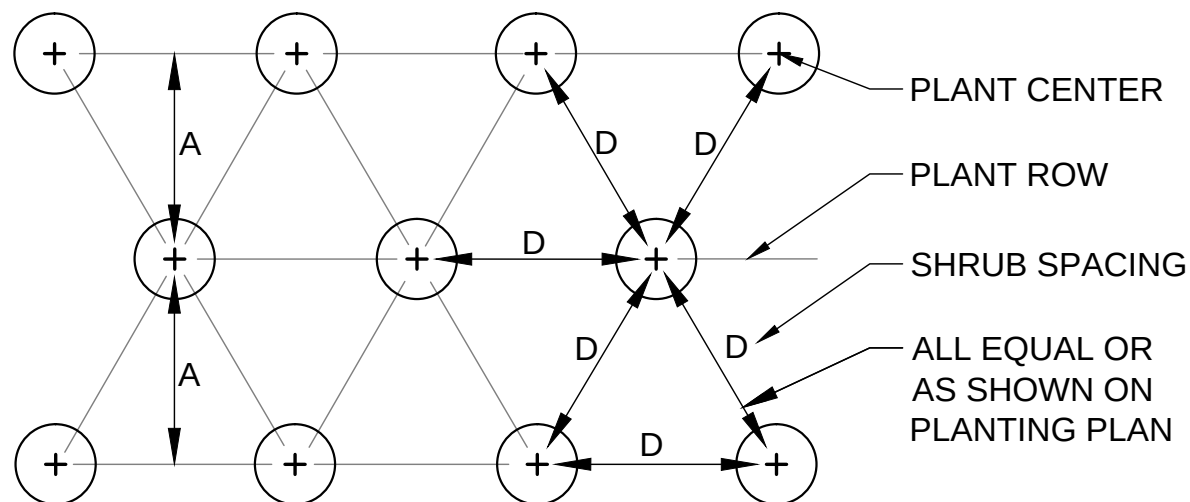
010_CREVE_COEUR_Planting



SPACING "D"	ROW "A"	NUMBER OF PLANTS/SQ. FT.
36"	31.2"	.110
30"	26.0"	.160
24"	20.8"	.250
18"	15.6"	.450
15"	13.0"	.640
12"	10.4"	1.00
10"	8.66"	1.44
8"	6.93"	2.25
6"	5.19"	4.00



SPACING "D"	ROW "A"	NUMBER OF PLANTS/SQ. FT.
24"	20.8"	.250
30"	26.0"	.160
36"	30.0"	.110
4'	3.46'	.060

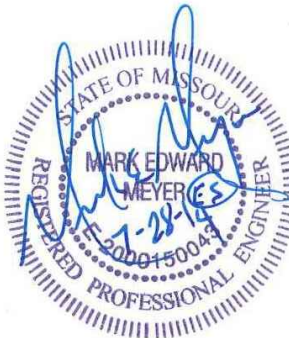


ILINC Engineering Incorporated
MO Certificate of Authority
2000152987
16253 Swingley Ridge Rd.
Suite 100
Chesterfield, MO 63017
Phone (636) 777-3000
Fax (314) 432-5812

Creve Coeur Dam and Channel
11400 Olde Cabin Road
Creve Coeur MO 63141
Creve Coeur, St Louis County, Missouri

THE PROFESSIONAL WHOSE SIGNATURE AND PERSONAL SEAL APPEAR HEREON, ASSUMES RESPONSIBILITY ONLY FOR WHAT APPEARS ON THIS PAGE, AND DISCLAIMS (PURSUANT TO SECTION 327 ALL RSMO) ANY RESPONSIBILITY FOR ALL OTHER PLANS, SPECIFICATIONS, ESTIMATES, REPORTS, OR OTHER DOCUMENTS OR INSTRUMENTS NOT SEALED BY THE UNDERSIGNED PROFESSIONAL RELATING TO OR INTENDED TO BE USED FOR ANY PART OR PARTS OF THE PROJECT TO WHICH THIS PAGE REFERS.

Professional Engineer Seal
Mark Edward Meyer - Engineer
MO# 2000150043



Expiration Date: Dec. 31, 2014

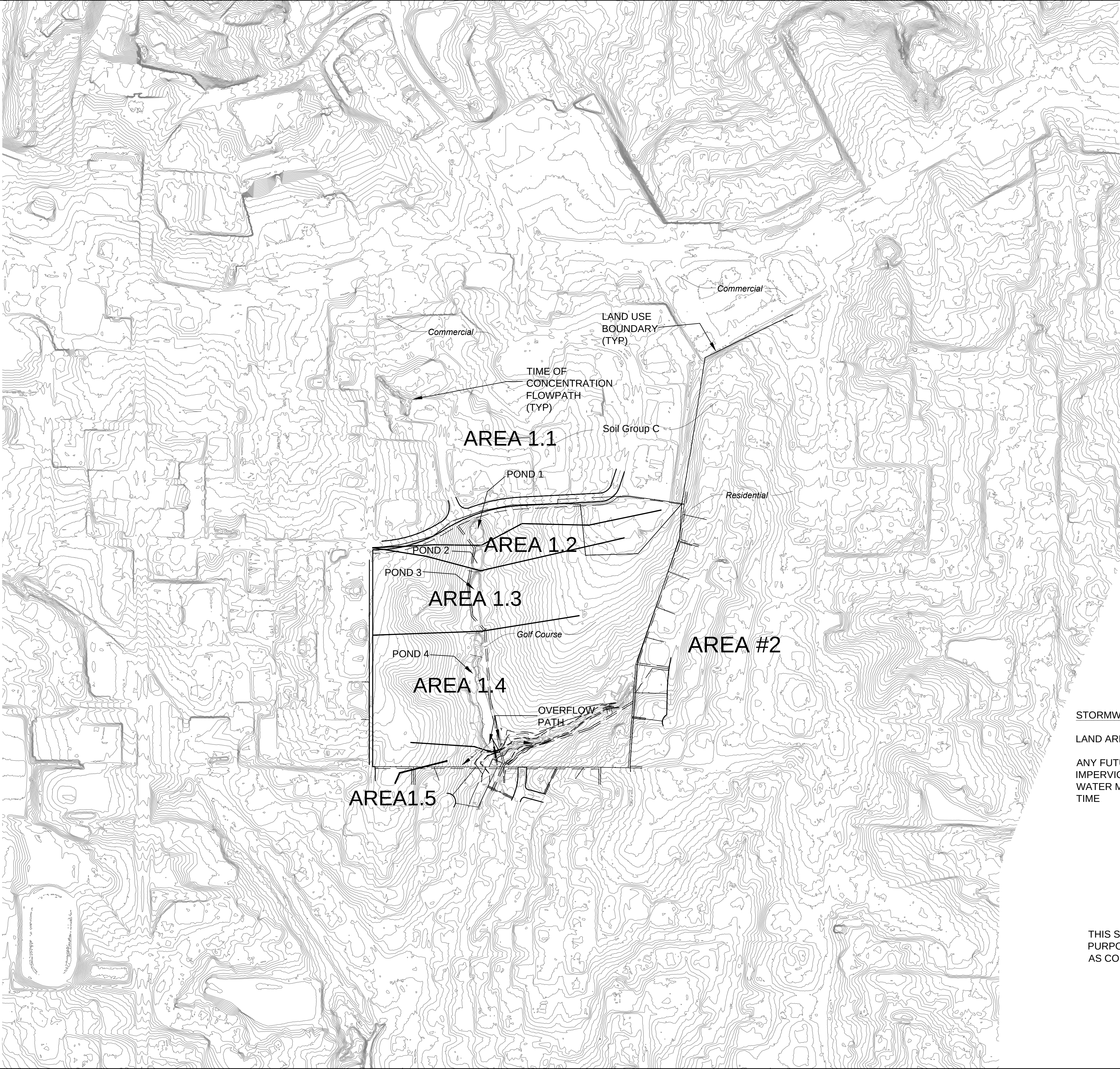
Rev	Date	Description
-	-	-
-	-	-
-	-	-
-	-	-

Project No. 1311
Designed: MEM
Drawn: JDF
Checked: TPD
Approved: MEM
Sheet Title:

PLANTING PLAN
DETIALS

Sheet Number:

C-7.1



AREA ID 1.1
DA = 81 AC
CN = 94
Tc = 7.9 MIN.
Q1 = 240 CFS
Q2 = 309 CFS
Q5 = 332 CFS
Q10 = 440 CFS
Q25 = 611 CFS
Q50 = 726 CFS
Q100 = 771 CFS

AREA ID 1.2
DA = 4.5 AC
CN = 83
Tc = 7.3 MIN
Q1 = 8 CFS
Q2 = 12 CFS
Q5 = 13 CFS
Q10 = 19 CFS
Q25 = 28 CFS
Q50 = 35 CFS
Q100 = 38 CFS

AREA ID 1.3
DA = 12.8 AC
CN = 80
Tc = 6.6 MIN
Q1 = 21 CFS
Q2 = 32 CFS
Q5 = 35 CFS
Q10 = 53 CFS
Q25 = 83 CFS
Q50 = 104 CFS
Q100 = 112 CFS

AREA ID 1.4
DA = 14.8 AC
CN = 80
Tc = 21.1 MIN
Q1 = 14 CFS
Q2 = 22 CFS
Q5 = 24 CFS
Q10 = 37 CFS
Q25 = 59 CFS
Q50 = 74 CFS
Q100 = 80 CFS

AREA ID 1.5
DA = 1.8 AC
CN = 80
Tc = 7.8 MIN
Q1 = 3 CFS
Q2 = 4 CFS
Q5 = 4 CFS
Q10 = 7 CFS
Q25 = 11 CFS
Q50 = 13 CFS
Q100 = 14 CFS

AREA ID 2
DA = 71.8 AC
CN = 87
Tc = 17.4 MIN.
Q1 = 114 CFS
Q2 = 159 CFS
Q5 = 174 CFS
Q10 = 246 CFS
Q25 = 363 CFS
Q50 = 442 CFS
Q100 = 473 CFS

STORMWATER MANAGEMENT NOTE:

LAND AREA DISTURBED = 0.9 ACRES

ANY FUTURE LAND DISTURBANCE AND/OR INCREASE IN IMPERVIOUS AREA ON THIS SITE MAY REQUIRE ADDITIONAL STORM WATER MANAGEMENT PER MSD REGULATIONS IN PLACE AT THAT TIME

THIS SHEET FOR DRAINAGE CALCULATION PURPOSES ONLY AND SHALL NOT BE USED AS CONSTRUCTION PLANS.



SCALE: 1"=300'

MSD P# - P29963-00, BASEMAP 17N4



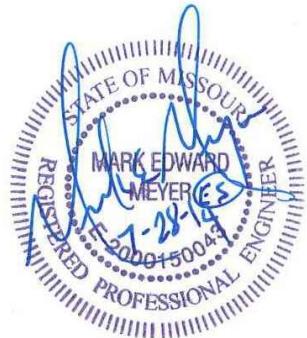
ILINC Engineering Incorporated
MO Certificate of Authority
2000152987
16253 Swingley Ridge Rd.
Suite 100
Chesterfield, MO 63017
Phone (636) 777-3000
Fax (314) 432-5812

Creve Coeur Dam and Channel

11400 Olde Cabin Road
Creve Coeur MO 63141
Creve Coeur, St Louis County, Missouri

THE PROFESSIONAL WHOSE SIGNATURE AND PERSONAL SEAL APPEAR HEREON, ASSUMES RESPONSIBILITY ONLY FOR WHAT APPEARS ON THIS PAGE, AND DISCLAIMS (PURSUANT TO SECTION 327.1 ALL RMO) ANY RESPONSIBILITY FOR ALL OTHER PLANS, SPECIFICATIONS, ESTIMATES, REPORTS, OR OTHER DOCUMENTS OR INSTRUMENTS NOT SEALED BY THE UNDERSIGNED PROFESSIONAL RELATING TO OR INTENDED TO BE USED FOR ANY PART OR PARTS OF THE PROJECT TO WHICH THIS PAGE REFERS.

Professional Engineer Seal
Mark Edward Meyer - Engineer
MO# 2000150043



Expiration Date: Dec. 31, 2014

Rev	Date	Description

Project No. 1311
Designed: MEM
Drawn: JDF
Checked: TPD
Approved: MEM
Sheet Title:

DRAINAGE AREA MAP

Sheet Number:

C-8.0

**CREVE COEUR
GOLF COURSE DAM REPAIR
JULY 7,2014**

CREVE COEUR GOLF COURSE DAM REPAIR

JULY 2014

The repair of this dam, desiltation of the ponds and repair of the discharge may very well amount to \$900,000.00 or more. Having repaired a number of dams and overflow weirs in the area, this repair is of particular concern. It is important to make sure that it is repaired in such a manner that future dam failures are virtually eliminated, that the continued desiltation is prevented and that the ponds provide adequate detention properties and controlled outflow consistent with the capability of the 8 foot MSD Concrete Reinforced Pipe receiving inlet.

As a City that prides itself as an environmentally responsible municipality it behooves the City to be responsible in managing the storm water quality through Best Management Practices of the Water Quality.

The City further has responsibility to the taxpayers to assure in so far as possible that all of the parties contributing to and benefitting from this utility also share in both its repair and maintenance.

And lastly, the City has the responsibility to provide **separately**, aesthetically acceptable landscaping and appearance of this utility as it is located on the Creve Coeur Golf Course which after all is really a City Park as sport complex.

Attached for your reference is the November 21, 2013 Metropolitan Sewer District letter to Intuition & Logic, the consultant whom the City employed to act and advise upon the City's behalf with the controlling agencies: Metropolitan Sewer District and The Corps of Engineers. Also attached are the first eleven pages of Intuition and Logic's USACE 404 permit application submitted to the District Engineer on April 8, 2014. Also included is my Email Exchange with the City Engineer, Matt Wahlberg on April 2, 2014.

I attended the P&Z Meeting on this subject on October 24, 2013 and was concerned that the plan being contemplated with and open overflow through the dam and expensive cut stone outflow was not only expensive but likely to repeat the failure just experienced. At that time I argued for a fully separate round overflow weir, in front of, and separate from the dam to provide maximum

available overflow area as well protect the integrity of the dam with an enclosed out fall in RCP (Reinforced Concrete Pipe) under the dam connected directly to the sinking MSD Runnymede 8' RCP storm water connection. It was also suggested that the East Tributary which begins with RCP be extended and connected to the RCP discharge pipe from the dam.

In all of the seven or eight earthen dam repairs I have been associated with (including 26 acre dam impoundments with height of 50') this is almost standard and classic design. I have been called in to repair three overflows of earthen dams with built in overflows that have failed. All three failed because the water circumvented the overflows either on the sides or bottom or both. We will explain the usual cause for this failure later in this report.

Along with another Creve Coeur interested citizen I first visited MSD's Office back in March of 2014 and reviewed the plans submitted to repair the dam. Again those initial plans submitted included the overflow in the dam and open outfall to the sinking MSD 8' receiving pipe. The singular information received at that meeting was that MSD was flexible in the outfall design and the design of the East Tributary as long as the Corps of Engineers were satisfied. I&L's response per the City Engineer is *"The concern is that enclosing the creek may not be permissible through the Army Corps of Engineers and **would have distracted from the issue at hand**"* Whatever that means?

And further, in Block 18 NATURE OF ACTIVITY of the 404 Permit Application, I&L has already assumed that the dam effluent channel and the East Tributary will remain open. *".....creating a new outlet structure with a boulder lined stilling basin at the the outfall, boulder retaining walls on either side of the existing reinforced concrete pipe, removing the existing concrete and gabioned east channel with a rock grade control at the upper and lower end of the new channel....."*

And in Block 23 DESCRIPTION OF AVOIDANCE, MINIMIZATION AND COMPENSATION:

".....'an enclose and cover' option was considered. This alternative was not considered viable due to the frequent overtopping of the existing spillway which drains into the east channel. Enclosing the channel will eliminate the condition whereby flow that overtops the spillway would be able to reconverge and enter the downstream enclosed storm water system."

Unless, adequate drop boxes were provided to access the enclosed system and the calculations are made to show that with an 8' concrete reinforced pipe enclosed system is inadequate after dredging the pond and having adequate retention capabilities of controlled flow. No calculations have been provided to date. Did I&L ask Geotechnology to provide them?

It would appear that I&L has decided the system that it wants to put in and has justified it with words without the data to prove it. Therefore, I&L may be correct (but no data has been supplied to my request to date) while this alternative provides long term lower cost and a place to dispose of significant additional amounts of the 900 cubic yards of dredged material at \$100.00 per yard. Maintenance of enclosed RCP is virtually nil compared with a vegetated stone lined open East Tributary.

Now the Consultant is also concerned that the silt removed "*May not be satisfactory fill material*", yet in Block 21 of the 404 report the consultant says 650 yards of soil will be used for fill material. Are we going to haul out 900 cubic yards of dredged material and haul in 650 yards of soil for fill because the Dredged material "*may not be satisfactory?*" **Where are the soil samples and the data? Was Geotechnology tasked to provide them?**

Dismissing this alternative "Out of Hand" requires serious re-consideration.

Although the MSD letter was received on November 21, 2013 the application for a permit from the Corps was not submitted until April 8, 2014 and further that I&L did not have a pre-submittal conference with the District Engineer's Office and concluded in their application that this water was Waters of the US without question. This water may very well be, but if the Corps ruled that it was not under questioning, then no permit would be required as I read the permit requirements. As an aside, I have always found it helpful to have informal meetings with the Corp of Engineers, The Dam Safety Office of the Missouri Department of Natural Resources (Dams over 35 feet) and the MSD Engineers Department before submitting requests. It starts one off on the right foot and saves a lot of time in avoiding re-do work.

As it turns out. The Corps, of course, held that the waters are Waters of the US (Why wouldn't they?) and have referred the City to the Missouri Department of Natural Resources for their requirements.

While this will not involve the DNR Dam Safety Committee it will involve the DNR water quality regulations. It will be interesting to learn what the DNR will require on this remediation, but my guess is there will be some stringent requirements on water quality and detention requirements.

Which brings us to the next consideration. We have been told there will be dire consequences if we disturb more than one acre of repair. What are the dire consequences? See MSD Letter dated November 21, 2013.

"STORM WATER – WATER QUALITY"

"Disturbed area being approximately 0.60 acres, storm water management practice of water quality will not be required for these 0.60 acres. If the disturbed area ends up being over 1 acre during the final design storm water management practice of water quality would be required."

Now there are several good reasons for doing this project as a whole and not splitting it up into two parts. First of all, as one of the two "Green" Cities in the state, I can hardly justify not doing this project as a whole on the basis of having to meet "Best Water Quality Management Practices" whether it was dictated by acreage disturbance or not. Creve Coeur's reputation as a responsible City requires us to abide by these practices regardless. Secondly, by doing the complete project at one time, there is only one project to be completed and one disturbance to the Golf Program. Third, we will know what all of the costs for this project will be and can manage them effectively. Fourth, we will not be continuing to add silt to the South pond area that we will have just completed cleaning out. And fifth, when it comes to financing and the alternatives and the responsibilities, the total cost can be presented to all of the parties involved without concern about coming back for a "Second Bite." I can see no justification for splitting up this project into several parts on the basis that Creve Coeur wants to avoid its responsibilities to "Best management Practices of Water Quality."

The pond siltation removal and adequate detention may require depths in excess of 8 feet. The MSD only requirement is that if that is done then the plans must be signed and sealed by a professional engineer registered in the State of Missouri with experience in this matter. Frankly, I refused to work on any project that

wasn't signed off by a Missouri State professional Soils Engineer. Certainly Geotechnology is qualified to sign it.

To date, we have not seen the Hydraulic Study calculations required by MSD. When available these calculations should be independently checked for accuracy by another registered engineer, as well as the Storm Water Management Facilities Report. Again based upon the current submission, MSD is requiring the sizing of the open basin during flood conditions. Another concern with this open channel plan. Has Geotechnology provided the calculations?

The 8' RCP entrance pipe to the Runnymede subdivision is sinking. A quick view of the photos show standing water in the front of the pipe indicating it is sloping down in front instead of being dry. The plan proposes building a head wall around pipe which would not be necessary if the pipe was jacked up and connected to an enclosed 8' out fall pipe from the dam. To the question, "of what happens if it continues to sink?" the answer is "That is MSD's problem." is not satisfactory. You just do not build something with the abdication of responsibility for your design. This is not consistent with historical Creve Coeur standards.

The reason I am so concerned about incorporating the overflow weir into the dam is for several basic reasons. If the weir is set 20' feet in front of the dam, the integrity of the dam as a singular mass is intact. The overflow of the waters into the weir has three hundred and sixty degrees of area to overflow, while the proposed built-in has only one face (the front) or about 90 degrees of available surface.

But most importantly is what happens in a severe drought. The concrete expands and the clay soil of the dam shrinks. If you do not think that concrete expands significantly in hot weather in St. Louis in July and August I will be please to take you to several houses where the street successfully moved the driveway, apron, driveway, garage floor and pushed in the basement wall to failure, requiring structural repair.

The clay shrinks and pulls away. You may have noticed that you can slide your hand between your foundation wall and the abutting soil. In a dam when it rains this void fills with water as the concrete shrinks faster than the soil expands and if you have a contraction soil crack or a nice little raccoon or groundhog decided to

make a home in the dam and just a little water seeps through, it is just a matter of time.

Basically, this is why the dam failed in the first place assisted by siltation which increased the flow velocity. The water simply found its way around the concrete structure, albeit it wasn't the best designed opening in the first place and was too deep into the dam. Yes, the proposal contains significant wing walls but will they be adequate? What about under the box riser?

There are a number of other minor considerations which I have included in the captions for each of the slides in the attached "Flash Drive" presentation of the Creve Coeur storm water system on the Golf Course. My concern is more that we "Get it right and complete" than "Get it done now." The golfers are not concerned with the condition of the ponds and stream, they are concerned with their golf score.

If this were my money, (\$900,000 plus) I would:

1. Require the data to justify the entire project for both this plan and properly priced out alternatives both in initial capital and maintenance.
2. A review by a second qualified engineering firm experienced for at least ten years in multiple dam repairs.
2. Require the consultant to provide several completed projects utilizing the in-dam weir system and date of installation, with client contacts.
3. If the City and Staff are determined to proceed with this plan then the consultant be required to provide at least a ten year guarantee against all failures of the dam and the flooding of the east tributary beyond his calculations.
4. An insurance bond to back up that guarantee.

Finally, I am not a professional engineer, but I am an experienced contractor who has fixed failures of dams and bid on others requiring significant repairs. My criticisms of this plan are based solely on the lack of hard data, calculations and what I infer are pre-determined preferences.

I am perfectly willing to change my mind if the staff and consultant can provide convincing evidence that this is the best, lowest cost and safest long term remediation alternative for this specific site. "Best looking is in the eye of....."

Until then, I remain opposed to spending any of the taxpayers' money on it.

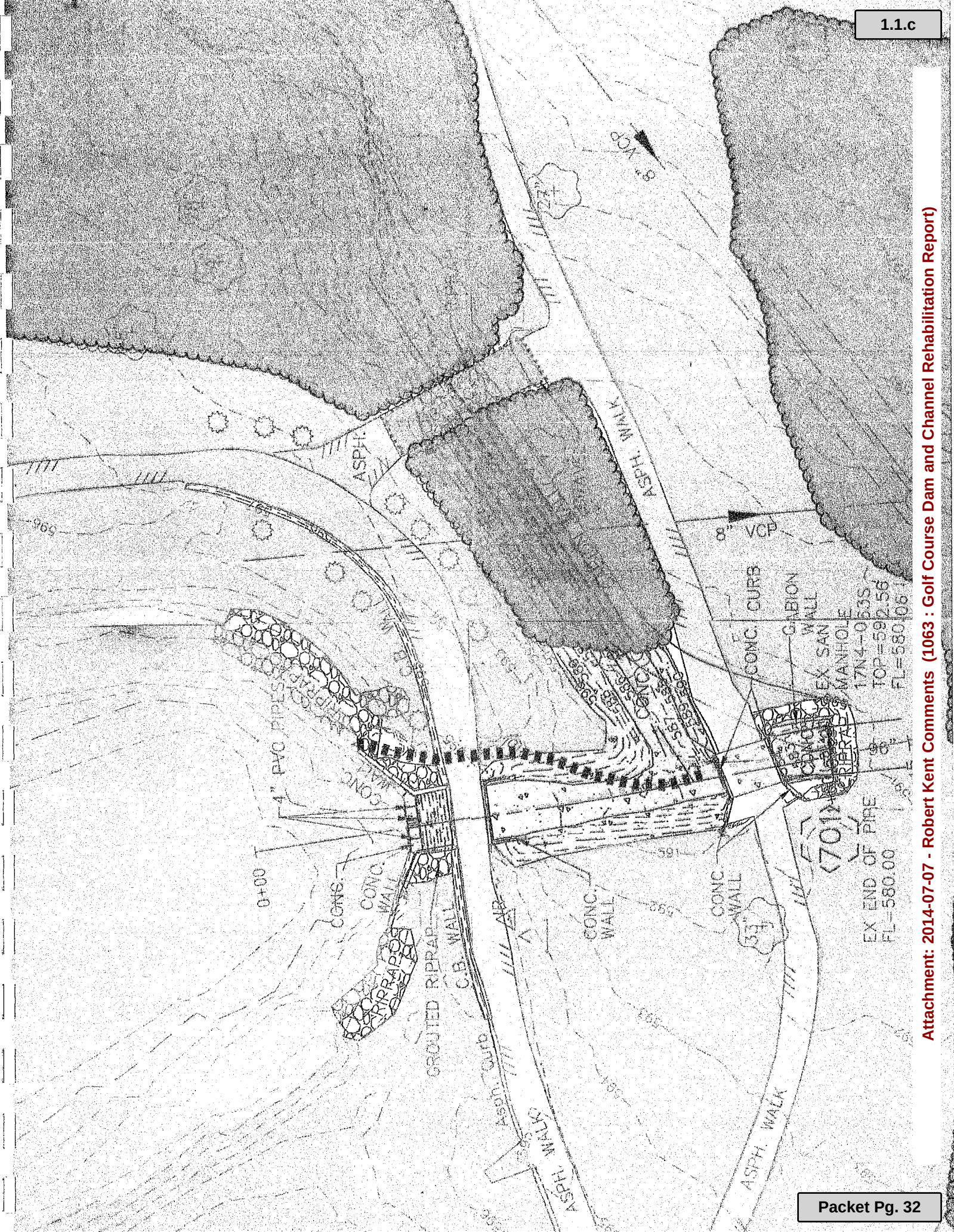
Submitted by:

Robert W. Kent

Ward IV Council Member

Paid for by: Bob Kent Ward IV Councilperson 13084 Ferntrails Lane Creve Coeur,
Missouri 63141

July 2014





**Metropolitan
St. Louis Sewer
District**
2350 Market Street
St. Louis, MO 63103-2555
(314) 768-6200

NOV 21 2013

November 21, 2013

Mark Meyer, P.E.
Intuition & Logic
16253 Swingley Ridge Rd, Suite 100
Chesterfield, MO. 63017

Re: Olde Cabin & Craig (Creve Coeur Dam & Channel – 11400 Olde Cabin Rd)
Basic Conceptual Review
MSD Ref. No. D-00243-00

Dear Mr. Meyer:

We have completed the **basic conceptual review** of the referenced Preliminary Plans. Based upon same, the following comments are provided:

Stormwater – Water Quality

Disturbed area being approximately 0.60 acres, stormwater management practice of water quality will not be required for these 0.60 acres. If the disturbed area ends up being over 1 acre during the final design, stormwater management practice of water quality would be required.

Since the existing site is less than 20% impervious, the work downstream of the dam would be designated as new development. The new outfall structure, dam, and desiltation of the lake will be considered maintenance.

Stormwater – 100-Year Hydraulic Study, Channel Protection, and Flood Protection

Per section 5.010.01 of the MSD Rules and Regulations, a 100-year hydraulic study will be required to determine the high water elevation in the channel at the existing 96" RCP culvert.

The site's 15 year, 20 minute differential will be based on the existing condition composite PI versus the post-developed composite PI value.

MSD recommends that this project meet the channel protection storage volume requirements as outlined in section 4.080.02.3 of the MSD Rules and Regulations. You can contact MSD if you have any questions.

This site is in the River des Peres watershed (Deer Creek sub-shed) which has a "Zero Increase" for flood protection (detention). Pre-developed detention routing models of the existing pond and spillway for the 2-year and 100-year, 24 hour rain events will be required for the project in order to determine the release rates for post-developed conditions. Use the existing condition, as defined above, to determine the site's composite CN value. The post-developed release rates shall not exceed the pre-developed conditions.

A Stormwater Management Facilities Report will be required for this project. This report shall include pre-developed and post-developed detention routing models for the following 24-hour, Type 2 scenarios:

- 1 year – with free outfall
- 2 year - with free outfall
- 100 year - with free outfall
- 100 year – with blocked low flow and free outfall
- 1 year - with a tailwater elevation per the 100-year hydraulic study
- 2 year - with a tailwater elevation per the 100-year hydraulic study
- 100 year - with a tailwater elevation per the 100-year hydraulic study

Since the basin discharges to an open channel, the low elevation of the basin is desirable to be above the 100-year flood elevation in the open channel as established by the 100-year hydraulic study. If the low elevation of the basin is below the channel flood elevation, then the basin shall be sized to store the entire design storm volume, unless directed otherwise by the District.

The maximum depth of water in a pond shall not exceed eight (8) feet. Projects which need a deeper basin to attain the required detention volume due to physical constraints may be evaluated on a case by case basis. The design and construction of dams greater than eight (8) feet or as directed by the District must be sealed and certified by a Professional Engineer registered in the State of Missouri with demonstrated expertise in geotechnical engineering.

The maximum fluctuation above permanent pool is six (6) feet.

Watershed ridgelines shall remain unchanged for existing and proposed conditions.

A maintenance agreement will be required for the area of the basin up to the normal pool elevation and it shall include the new outfall structure.

Stormwater – Other

For some channel and wetlands work, a 404 and/or 401 permit may be required from the Corps and MoDNR, respectively.

The realigned channel should be vegetated material to replicate existing conditions as much as possible. The final plans should indicate and detail the channel section and

the materials used.

Provide the downstream flowline elevation of the existing 96" RCP culvert.

If the "Culvert and Spillway" option is selected, then the final plans should provide details of these items and the materials used for the proposed open channel connection to the existing 96" RCP culvert.

If the "Riser and 48" Pipe" option is selected, then the final plans should provide details of these items and the materials used for the proposed open channel connection to the existing 96" RCP culvert.

It appears that a proposed headwall will be constructed at the existing 96" RCP culvert. The final plans should provide details of this item.

My investigation found no flooding or erosion problems immediately downstream of the project area.

Sanitary

Existing easements shall be shown and labeled with deed book and page.

Existing sanitary sewer manhole 17N4-057S shall be located on the plans and the information (top/flowline/pipe sizes/materials) shall be provided.

The existing 8" VCP sanitary sewer between structures 17N4-063S and 17N4-057S shall have a minimum cover of three (3) feet at the proposed grading areas and at the realigned channel crossing. The channel crossing must be protected with rock blanket or other approved stream stabilization/channel protection methods. Concrete encasement of the existing sanitary sewer is not an option. Provide a profile of this existing sewer reach depicting the proposed grading over it.

Provide the existing sanitary sewer information on all necessary profiles and cross sections.

Provide information on the sanitary sewer overflow (SSO) that was indicated in "Construction & Grading Note" #32 located on plan sheet 2. MSD does not have any record of an existing SSO upstream of the project area.

Other Issues

If the project has offsite construction, a general liability certificate of insurance will be required prior to pulling the MSD permits.

Provide a description of the MSD/USGS benchmark used for the plans.

Provide Property Owner information (name, book/page, address, locator number, etc.) on each plan sheet.

Provide Property Owner Information (name, book/page, address, locator number, etc.) for one adjacent parcel on each plan sheet.

Unless otherwise indicated, any requirements mentioned in the conceptual review should be addressed during the formal P-job plan review process. Conceptual review is normally done only once. Any new questions or other additional changes to the originally submitted plans should normally be resolved during the plan review.

These comments are based on the submitted preliminary plans and data and are provided as an initial guide.

Conceptual review is subject to requirements of detailed review of final design plans and is subordinate to the review and approval of said final design plans. This project is not currently under review of final project plans.

Sincerely,



Chris Betts, P.E.

Civil Engineer

MSD Engineering / Planning – Development Review

Cc: John Alexander, P.E. – MSD

Attachment: 2014-07-07 - Robert Kent Comments (1063 : Golf Course Dam and Channel Rehabilitation Report)

INTUITION & N LOGIC

16253 Swingley Ridge Rd, Suite 100 St. Louis, MO 63017
636-777-3000 314.432.5812

LETTER OF TRANSMITTAL

TO: U.S. Army Corps of Engineers
St. Louis Regulatory Branch
1222 Spruce Street
St. Louis, MO 63103

DATE: April 8, 2014

PROJECT: Creve Coeur Dam and Channel

RE: USACE 404 Permit Submittal

Please find attached and/or enclosed:

☒ For approval ☐ For your use ☐ As requested
☐ For review and comment ☐ Amend and resubmit

Quantity	Dated	Description
1	12/30/2013	Half size Preliminary Plan Set
1	04/08/2014	USACE 404 Engineering Form 4345 and attachment

COMMENTS:

Sir or Madam,

Please find the above listed items enclosed for your review and comment. Please contact me at (636) 777-3000 or mark@ilincworld.com if you have any questions.

Thank you,
Mark

From: Mark Meyer, PE
Intuition & Logic

cc: File

It is by LOGIC that we prove
but by INTUITION that we discover

INTUITION & LOGIC

16253 Swingley Ridge Rd, Suite 100 St. Louis, MO 63017

636-777-3000 314.432.5812

April 8, 2014

U.S. Army Corps of Engineers
St. Louis Regulatory Branch
1222 Spruce Street
St. Louis, MO 63103

Re: Creve Coeur Dam and Channel

Dear Sir or Madam:

Intuition & Logic is pleased to present the USACE 404 Permit Application and supporting information for the Creve Coeur Dam and Channel Project. Enclosed please find the 404 permit application and preliminary plan set.

The Creve Coeur Dam and Channel project is intended to correct the Dielman Dam which has been breached near the overflow structure and the failing concrete lined receiving channel at 11400 Olde Cabin Road in Creve Coeur, MO.

Proposed improvements will consist improving the earth dam, creating a new outlet structure with a boulder lined stilling basin at the outfall, boulder retaining walls on either side of the existing reinforced concrete pipe, removing the existing concrete and gabion east channel and realigning it to the south, installing a rock grade control for the lower end of the east channel, dredging the pond, installing a solar powered bubbler system, installing aquatic shelves around the pond edge along with a boulder edge in selected locations along the pond.

Natural stream morphology is incorporated into the design of all the proposed channel improvements. No wetlands will be impacted by these proposed channel improvements.

If you have any questions or comments please feel free to contact me at (636) 777-3000.

Best regards,

Mark Meyer, PE
President

It is by LOGIC that we prove
but by INTUITION that we discover

Attachment: 2014-07-07 - Robert Kent Comments (1063 : Golf Course Dam and Channel Rehabilitation Report)

17. DIRECTIONS TO THE SITE

Heading south on Interstate 270, take exit for MO 340 east. From here, take a left onto Olive Blvd followed by a right onto North New Ballas Road. Finally, the second left will be Old Ballas Rd which will turn into Olde Cabin Rd. The project area is to the right in the golf course at the southern most pond.

18. Nature of Activity (Description of project, include all features)

Please See Exhibit A

19. Project Purpose (Describe the reason or purpose of the project, see instructions)

Please See Exhibit A

USE BLOCKS 20-23 IF DREDGED AND/OR FILL MATERIAL IS TO BE DISCHARGED

20. Reason(s) for Discharge

Please See Attached Exhibit A

21. Type(s) of Material Being Discharged and the Amount of Each Type in Cubic Yards:

Type	Type	Type
Amount in Cubic Yards	Amount in Cubic Yards	Amount in Cubic Yards

Please See Attached Exhibit A

22. Surface Area in Acres of Wetlands or Other Waters Filled (see instructions)

Acres Please See Attached Exhibit A

or

Linear Feet

23. Description of Avoidance, Minimization, and Compensation (see instructions)

Please See Attached Exhibit A

24. Is Any Portion of the Work Already Complete? ☐ Yes ☒ No IF YES, DESCRIBE THE COMPLETED WORK

25. Addresses of Adjoining Property Owners, Lessees, Etc., Whose Property Adjoins the Waterbody (If more than can be entered here, please attach a supplemental list).

a. Address- Please See Attached Exhibit A

City - State - Zip -

b. Address-

City - State - Zip -

c. Address-

City - State - Zip -

d. Address-

City - State - Zip -

e. Address-

City - State - Zip -

26. List of Other Certificates or Approvals/Denials received from other Federal, State, or Local Agencies for Work Described in This Application.

AGENCY	TYPE APPROVAL*	IDENTIFICATION NUMBER	DATE APPLIED	DATE APPROVED	DATE DENIED

* Would include but is not restricted to zoning, building, and flood plain permits

27. Application is hereby made for permit or permits to authorize the work described in this application. I certify that this information in this application is complete and accurate. I further certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.

SIGNATURE

SIGNATURE OF APPLICANT

DATE

SIGNATURE OF AGENT

DATE

The Application must be signed by the person who desires to undertake the proposed activity (applicant) or it may be signed by a duly authorized agent if the statement in block 11 has been filled out and signed.

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than \$10,000 or imprisoned not more than five years or both.

INTUITION & N LOGIC

16253 Swingley Ridge Rd, Suite 100 St. Louis, MO 63017
636-777-3000 314.432.5812

Exhibit A

To: Application for Department of the Army Permit Section 404
By: Mark Meyer
Date: April 8, 2014
Re: USACE 404 Permit Application Supplemental Information for
Creve Coeur – Dam and Channel Project

Below is a continuation of the 404 Permit Application block numbers 18, 19, 20, 21, 22, 23, and 25.

Block 18. Nature of Activity:

Natural stream morphology is incorporated into the design of all the proposed channel improvements. The project consists of replacing an existing breached dam and over flow structure and associated improvements. The proposed work includes improving the earth dam, creating a new outlet structure with a boulder lined stilling basin at the outfall, boulder retaining walls on either side of the existing reinforced concrete pipe, removing the existing concrete and gabion east channel and realigning it to the south, installing a vegetated rock lined channel with a rock grade control at the upper and lower end of the new channel, dredging the pond, installing a solar powered bubbler system, installing aquatic shelves around the pond edge along with a boulder edge in selected locations along the pond.

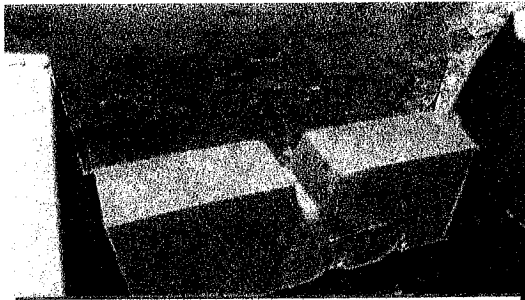
Excavation in the channel will be limited to that necessary to construct the proposed slopes and grade controls. Rock grade controls will typically be 3 to 4 ft deep.

Block 19. Project Purpose

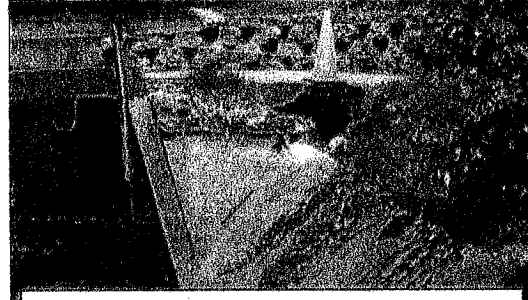
Dielman Dam has been breached in the vicinity of the existing overflow structure, and the concrete lined receiving channel is failing. The project is being constructed to replace these failing structures. The concrete and gabion lined east channel will be restored. Additionally, the city intends to dredge the south pond and make aesthetic improvements concurrently with the dam and channel repair work.

It is by LOGIC that we prove
but by INTUITION that we discover

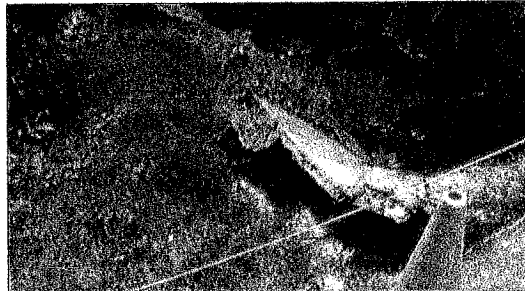
Attachment: 2014-07-07 - Robert Kent Comments (1063 : Golf Course Dam and Channel Rehabilitation Report)



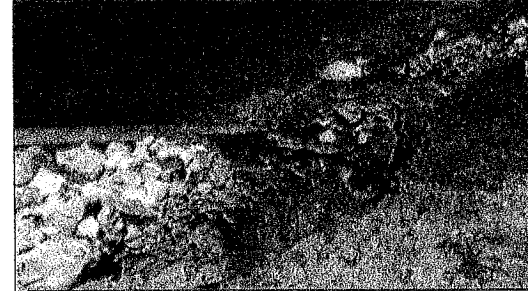
Existing Overflow Structure at
Dielman Dam



Piping through earthen dam at the
existing overflow on Dielman Dam



Piping through earthen dam at the
existing overflow on Dielman Dam



Piping through earthen dam at the
existing overflow on Dielman Dam



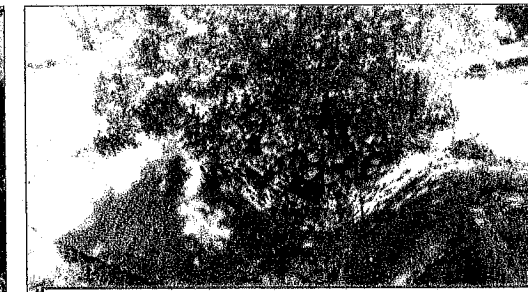
Silted in lower portion of the lake
above Dielman Dam



Piping through earthen dam at the
existing overflow on Dielman Dam

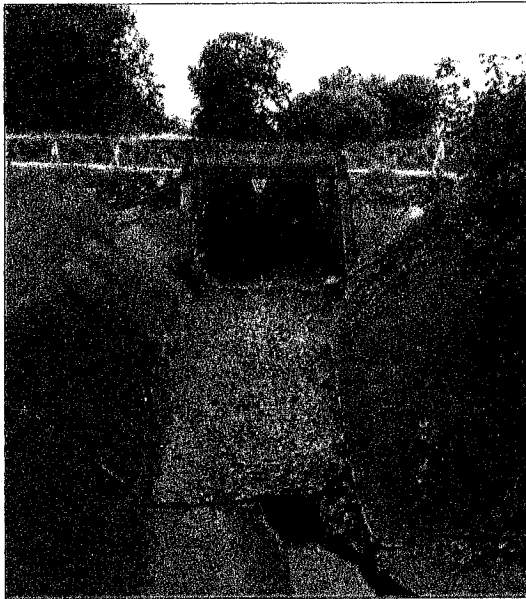


Concrete and Rock Gabion Lined
Channel below Dielman Dam



Concrete and Rock Gabion Lined
East Channel

It is by LOGIC that we prove
but by INTUITION that we discover



Failing concrete lined overflow
channel downstream of Dielman Dam

It is by LOGIC that we prove
but by INTUITION that we discover

Block 20. Reason(s) for Discharge:

Material will be discharged due to construction of earth dam and channel restoration activities. The dam and channel restoration is intended to restore the dam and overflow structure as well as control erosion. The bank stabilization, stilling basin, and grade controls are intended to protect the bed and banks from scour and erosion, as well as preventing channel incision. Pond dredging is an ongoing maintenance item intended to restore the pond to its intended dimensions.

Block 21. Type(s) of Material being discharged and the amount of each type in cubic yards:

Proposed improvements will have the following impacts to the existing natural resources:

Channel

- 100 LF of Concrete and Gabion Channel Impacts to construct grade control channel
- 360 LF of Concrete and Gabion Bank Impacts (Total length of both banks)

Proposed mitigation and restoration activities include:

- 180 LF of vegetated rock channel armoring, rock grade control within proposed east channel and stilling basin
- 100 LF of Bank Stabilization in stilling basin
- 220 LF of Bank Stabilization in channel

Proposed Cut and Fill volume totals are as follows:

- | | |
|--|---|
| <ul style="list-style-type: none"> • 1000 cubic yards of cut material for entire project • 900 cubic yards of pond dredging <hr/> <p>1900 cubic yards of cut</p> | <ul style="list-style-type: none"> • 650 cubic yards of soil used for fill material for entire project • 50 cubic yards of limestone used for fill material in stilling basin bed • 200 cubic yards of limestone used for fill material in east channel bed and banks <hr/> <p>900 cubic yards of fill</p> |
|--|---|

Block 22. Surface area in acres of wetlands or other waters filled:

0.11 acres of pond will be affected by the project. Downstream of the pond, 0.04 acres of concrete channel bed and stilling basin considered to be Waters of the US will be removed and restored. No wetland impacts are anticipated during the construction of this project.

Block 23. Description of Avoidance, Minimization and Compensation:

It is by LOGIC that we prove
but by INTUITION that we discover

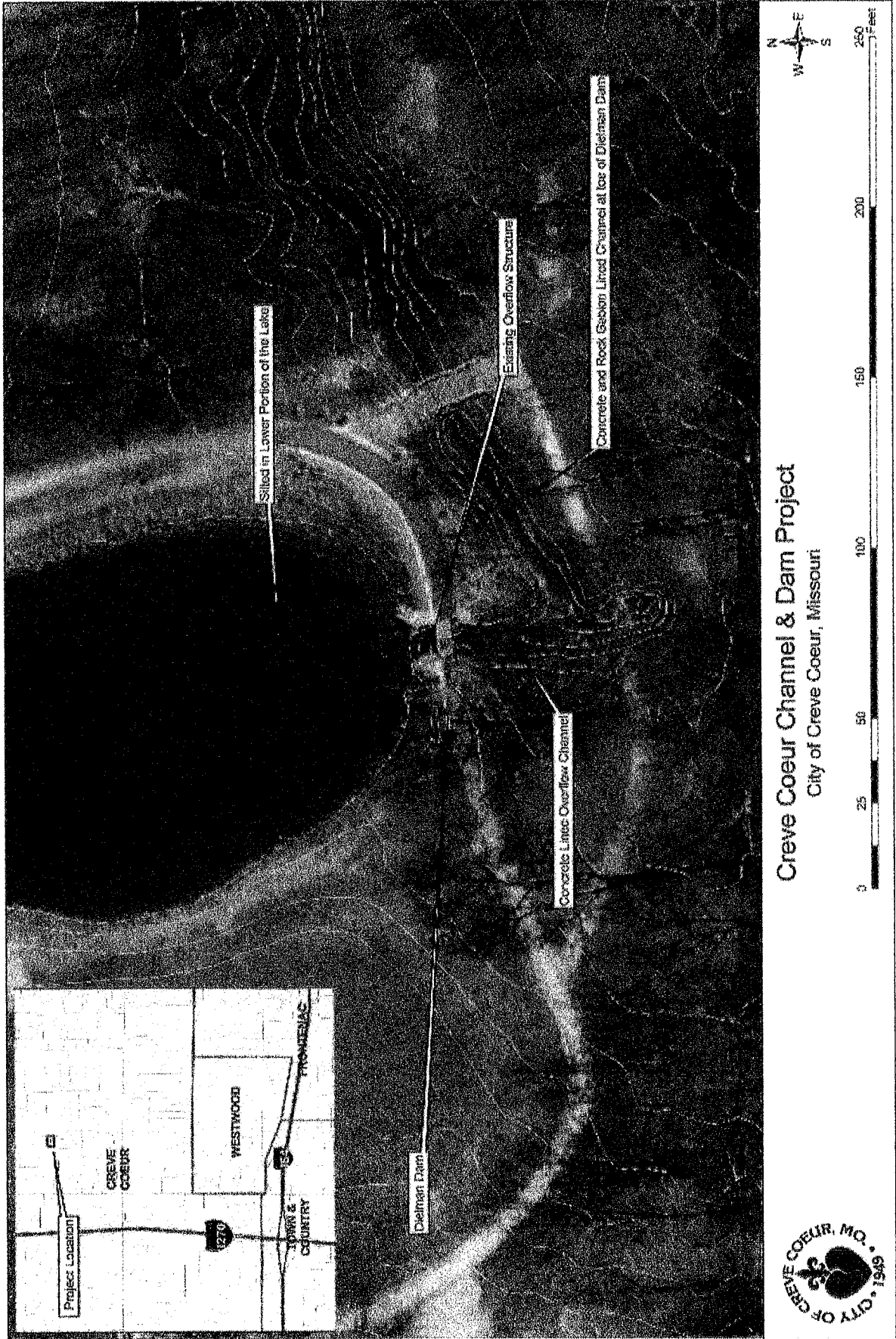
A Do Nothing option is not feasible due to the existing dam breach and failure of the concrete in the receiving channel. Alternative corrections were considered, however, these were not considered viable. Removal and replacement of the existing structure was considered. This alternative was not considered viable as the existing maintenance issues and failure mechanism are not addressed.

An enclose and cover option was considered. This alternative was not considered viable due to the frequent overtopping of the existing spillway which drains into the east channel. Enclosing the channel will eliminate the condition whereby flow that overtops the spillway would be able to reconverge and enter the downstream enclosed stormwater system. The proposed plan minimizes the impact to the existing stream.

A SWPPP or erosion control plan will be included as part of the construction plans for avoidance of impacts to Water of the US during construction. The proposed dam and channel improvements will include bank restoration of the adjacent banks along the pond and the channel. The proposed bank restoration provides native planting appropriate for a riparian corridor.

Block 25. Addresses of adjoining property owners, lessees, etc. whose property adjoins the water body:

Creve Coeur Golf Club
 11400 Olde Cabin Rd
 Creve Coeur, MO 63141



Bradshaw, Theresa

From: Wohlberg, Matt
Sent: Wednesday, April 02, 2014 5:19 PM
To: Robert Kent
Cc: Heines, Jim; Barnes, Kirsten; Lawrence, Ellen; charlottedalfonso@yahoo.com; Kreuter, Dave; Wang, A.J.; Saunders, Scott; Glantz, Barry; Kramer, Cynthia; Hoffman, Robert; Perkins, Mark C.; Rhoades, Jeanne
Subject: RE: Stormwater Control and repairs at CC Golf Course

Mr. Kent,

Thank you for your comments regarding the dam project. Please find my responses below (in blue). I will be happy to discuss these topics further, if you wish.

The conceptual design/alternative review report is too big to send. I can extract several pages of the document that have the estimate information for you and send those tomorrow.

Sincerely,

Matt

CITY OF CREVE COEUR

Matt Wohlberg, P.E.
 City Engineer

300 N. New Ballas Road
 Creve Coeur, MO 63141
 Phone: (314) 442-2084
 Fax: (314) 872-2505

www.creve-coeur.org

Mr. Wohlberg:

It is understood that the City is currently making some temporary repairs to the South Pond Dam to get us through the next golf season. Looking down the road a bit and having done some research on this subject, (And having replaced pond risers, pressure grouted dams and performed other such repairs during the time I was actively managing my concrete restoration company) I have the following questions concerning the repair of the entire system.

This is important now that I understand that the legal investigation reveals that the City is entirely responsible for the mitigation of the storm water problem.

The questions are:

- Has the consultant determined the cost to install a fore bay and siltation cleanout bay in the North Pond?
Not exactly. The conceptual cost estimate included removal of silt from the northern lakes and the installation of a hydrodynamic separator unit to pull silt out of the stormwater before it reaches the lakes. The estimated cost of this work was \$410,000 (say, \$400,000 to \$450,000). I imagine silt removal and creating an armored-bottom fore bay out of the northern lake would cost about the same.
- Has the consultant evaluated the cost to repair the stone walls of the North Pond?
No. The extent of any issues with these walls and the cost of necessary repairs are currently unknown.
- Has the consultant determined the cost to clean out the three north ponds, the intervening creek and the South Pond?
Silt removal from the creek was not included in the review. The estimate for silt removal from the northern ponds is \$310,000, and the estimate for silt removal from the southern pond is \$130,000. The estimate was \$100 per cubic yard of material removed, hauled away, and disposed of.
- Has the consultant determined the cost to upgrade the rip-rap of the ponds and the creek, install stone edging along the top of each to facilitate mowing?
Replacement of the rip rap along the northern ponds (those without the boulder wall) with a boulder edge was estimated to be \$75,000.
- Has the consultant determined whether he wants to add and compact soil to the dam or perform deep pressure grouting of the existing structure?
The proposal is to add and compact soil to the dam.
- Has the consultant contacted the Corps of Engineers to get a 404 permit for the East Tributary?
We have just recently submitted for the 404 permit. The initial goal for the project was to make the repair as soon as possible, and we could forego the 404 permit when we were operating on an emergency basis. This is no longer the case, so we applied for the permit.
- Has the consultant evaluated the cost of installing a continuation of the reinforced concrete pipe of the East Tributary to the confluence and connection with the 54" proposed drain pipe under the dam?
I discussed enclosing the east tributary with the consultant in November. The concern is that enclosing the creek may not be permissible through the Army Corps of Engineers and would have distracted from the issue at hand.
- Has the consultant calculated the hydraulics with this regard as to the input to the Runnymede extension?
The hydraulics of the existing and proposed conditions have been modeled, and the design and these models continue to be revised to meet the satisfaction of MSD. Our intent with the project has been to create no increase in the amount of water that enters into the 96" pipe that runs south to the Runnymede subdivision (beyond the flow that would be before the problems with the dam). Adding to this flow will prompt MSD to require that the modeling extend beyond the entrance to this pipe, and this will only drive up the cost of the design. Regarding the 96" pipe, our best option appears to be to leave it alone. In addition to the extra modeling, MSD will require that either a headwall or a flared-end section is installed at the end of the pipe if the pipe is modified in any way. MSD has given us the option to leave the pipe alone, and I think we should take it.
- Has the consultant determined the cost of re-grading the entire East tributary and re-grading or rebuilding of the collapsing gabion walls of the East tributary versus installing the extension of the East tributary concrete pipe?
No. See question #7.
- Has the consultant considered the savings to be had by using the removed siltation material to fill over the buried reinforced concrete pipe draining the South pond and East tributary versus having to haul it to a dump?
We discussed using the silt from the pond to fill the east tributary. Beyond the concerns stated in question #7, the consultant was concerned that the silt that was removed may not be permissible as a fill material.
- Has the consultant evaluated the costs of remediation of the golf course twice if done in two phases (North and South) versus doing it in one complete program?
We did not get an estimate for restoring both the north and south areas, but I imagine that this work will be about the same cost whether done as part of one project or two. The areas are relatively far apart, and there will not be any redundancy in disturbance if the project is in two phases, so there does not appear to be a significant amount of savings in this regard for doing both north and south projects at once. The City is eliminating the need and cost for restoring the south area twice by combining the dam repair with the siltation removal in the south pond. We are also looking at making the first phase of the golf cart path replacement extend off of the south end of the course so that those construction vehicles use and disturb the same area (in August) that will be restored next winter after the dam repair.
- Have they considered how much additional siltation and double work will be required if they do it in two phases?
We do not have an estimate for how much silt may enter the south pond in the years between making the repair in the south and the one in the north.
- Has the consultant estimated the cost to clean out the overgrown honeysuckle and other trash trees and collapsed materials in the creek and ponds?
The consultant estimated that removing invasive species along the east channel, addressing some grading concerns, and planting native species would cost \$60,000 (or \$300 per linear foot of the creek). No estimate was provided for the ponds.

I recognize these are a lot of questions, but you can hardly make informed decisions on whether to do this one phase or two phases if you do not have substantial facts. Doing the South end and HOPING that you do not have surprises on the North end is not good planning or financial decision making.

At this point, the north ponds are stable. There does not appear to be an emergency to address these ponds immediately (but there did not appear to be an emergency at the dam a year ago either). We can plan for what we know and for what we can see, but there will always be some surprises. The failure of the dam and the resulting discussion and planning for its repair has given much more attention to the northern ponds than would have been otherwise. As it stands, the plan to make improvements to the northern ponds within the next five years is much more proactive than what has transpired for the south pond and dam. Staff would recommend an acceleration of this schedule if we notice that conditions are getting worse. I think that we have two very different situations with the north ponds and the south pond and dam. The north ponds were dredged out within the past ten years and are coming due for another round of silt removal. The south pond was not dredged out when the northern ponds were most recently, and this work was put on as a near-term project in the CIP projections last year. The main difference between these areas, and what has forced the issue recently, is the failing dam. We are learning that the dam and its concrete channel have had issues for as long as 30 years. A plan from the early 1980s indicates that eroded areas all around the channel needed attention, and the existing channel has several drill holes where the channel had been mudjacked or similar in the past. We do not have a similar situation at the north end, as far as we know. I am hoping (and I used that word on purpose) that the increased attention to the lakes through the current project and the planned improvements in the near term will reduce the chance that there will be significant surprises for the north end. If we are planning to have the construction at the north end within five years, the survey and design need to start within the next three or four years so that the permitting can be in place for construction to start on time. Monitoring the site for three years before a survey and engineering review occurs seems appropriate.

In my opinion, it is a lot more important to be paying them to provide these necessary facts, than what color stone to use or what landscape plantings might be appropriate.
If any or all of these estimates have been completed, I would appreciate a copy to review.

From: kentivcouncil@charter.net [mailto:kentivcouncil@charter.net]

Sent: Thursday, March 27, 2014 12:57 PM

To: Wohlberg, Matt

Cc: Heines, Jim; Barnes, Kirsten; Lawrence, Ellen; charlottedalfonso@yahoo.com; Kreuter, Dave; Wang, A.J.; Saunders, Scott; Glantz, Barry; Kramer, Cynthia; Hoffman, Robert; Perkins, Mark C.; Rhoades, Jeanne

Subject: Stormwater Control and repairs at CC Golf Course

Mr. Wohlberg:

It is understood that the City is currently making some temporary repairs to the South Pond Dam to get us through the next golf season.

Looking down the road a bit and having done some research on this subject, (And having replaced pond risers, pressure grouted dams and performed other such repairs during the time I was actively managing my concrete restoration company) I have the following questions concerning the repair of the entire system.

This is important now that I understand that the legal investigation reveals that the City is entirely responsible for the mitigation of the storm water problem.

The questions are:

Has the consultant determined the cost to install a fore bay and siltation cleanout bay in the North Pond?

Has the consultant evaluated the cost to repair the stone walls of the North Pond?

Has the consultant determined the cost to clean out the three north ponds, the intervening creek and the South Pond?

Has the consultant determined the cost to upgrade the rip-rap of the ponds and the creek, install stone edging along the top of each to facilitate mowing?

Has the consultant determined whether he wants to add and compact soil to the dam or perform deep pressure grouting of the existing structure?

Has the consultant contacted the Corps of Engineers to get a 404 permit for the East Tributary?

Has the consultant evaluated the cost of installing a continuation of the reinforced concrete pipe of the East tributary to the confluence and connection with the 54" proposed drain pipe under the dam?

Has the consultant calculated the hydraulics with this regard as to the input to the Runnymede extension?

Has the consultant determined the cost of re-grading the entire East tributary and re-grading or rebuilding of the collapsing gabion walls of the East tributary versus installing the extension of the East tributary concrete pipe?

Has the consultant considered the savings to be had by using the removed siltation material to fill over the

buried reinforced concrete pipe draining the South pond and East tributary versus having to haul it to a dump?

Has the consultant evaluated the costs of remediation of the golf course twice if done in two phases (North and South) versus doing it in one complete program?

Have they considered how much additional siltation and double work will be required if they do it in two phases?

Has the consultant estimated the cost to cleanout the overgrown honeysuckle and other trash trees and collapsed

materials in the creek and ponds?

I recognize these are a lot of questions, but you can hardly make informed decisions on whether to do this one phase or two phases if you do not have substantial facts.

Doing the South end and HOPING that you do not have surprises on the North end is not good planning or financial decision making.

In my opinion, it is a lot more important to be paying them to provide these necessary facts, than what color stone to use or what landscape plantings might be appropriate.

If any or all of these estimates have been completed, I would appreciate a copy to review.

I appreciate your patience and close attention.

Further, I will be available for any questions, clarifications or discussion of the pros and cons of these items to you and/or the consultant at your convenience, if you so desire.

Bob Kent



DEPARTMENT OF PUBLIC WORKS STAFF MEMORANDUM

DATE: August 22, 2014

TO: Mark Perkins, City Administrator

CC: Jim Heines, Director of Public Works

FROM: Matt Wohlberg, P.E., City Engineer

SUBJECT: Response to Comments
Dam, Detention Pond, and Channel Rehabilitation Project

Below, please find my response to several of the comments made by Councilmember Kent in his review of the project entitled "Creve Coeur Golf Course Dam Repair" and dated July 7, 2014. Mr. Kent's comments are included in italics, with my response following.

Comment: *It would appear that [Intuition & Logic] has decided the system that it wants to put in and has justified it with words without the data to prove it.*

Response: The design pursued by Intuition & Logic reflects the direction provided to them by the City's Stormwater Committee, Parks and Recreation Committee, Planning and Zoning Commission, City Council, and staff through the development of concept approaches to solve the hole in the dam, the failing concrete channels, and the siltation of the southern lake. The design is not simply an idea thought up by Intuition & Logic. Rather, it is their attempt to provide a viable solution to the problems and meet the various parameters set by the City.

Comment: *Are we going to haul out 900 cubic yards of dredged material and haul in 650 yards of soil for fill because the Dredged material "may not be satisfactory?" Where are the soil samples and the data? Was Geotechnology tasked to provide them?*

Response: The material that will be brought to the site will be used to reconstruct the dam after the existing spillway structure is removed. The 900 cubic yards of dredge material will not be suitable material for dam construction, particularly due to the amount of moisture that will be in the dredged material. The dam will be constructed using specific soil types with a specific range of moisture allowed in order to achieve compaction and long-term impermeability. Soil samples are not needed to prove this.

Comment: *Dismissing this alternative [to enclose the east channel with dredge materials from the lake] “Out of Hand” requires serious re-consideration.*

Response: The design team of Intuition & Logic, Geotechnology, Inc., and SWT Design was hired by the City to design this project based, in large part, upon their past experience with the sort of design and permitting required to address the dam and lake at the golf course. Basing a decision or recommendation on experience is not the same as arbitrarily dismissing an idea, as is implied in the comment. Rather, the serious consideration requested has been made over years of work and attempts to solve similar problems in the past. The City aims to hire consultants who use their experience to know which alternatives to pursue and which to dismiss: that is how projects are designed correctly and efficiently.

Comment: *I can see no justification for splitting up this project into several parts on the basis that Creve Coeur wants to avoid its responsibilities to “Best management Practices of Water Quality.”*

Response: City staff agrees with this comment, but the implication of this comment is that the City intends to avoid its responsibilities under the Clean Water Act as a Municipal Separate Storm Sewer System (MS4). The City is obligated to meet certain stormwater regulations through its development, and the City embraces these obligations. In no way does the City or its staff intend for the City to “avoid its responsibilities” with regard to water quality.

Features that will meet the City’s obligations for water quality are planned for the subsequent phase(s) of the rehabilitation and improvement of the entire stormwater system at the golf course. These include rain gardens or similar features in the drainage paths throughout the golf course and modifications to the northern lakes, as appropriate. The fact that only minimal water quality features are incorporated into the dam and channel design is not a reflection of avoidance of any stormwater regulations. Instead, this reflects looking ahead to the future phases with the northern ponds and to the rest of the golf course to improve water quality rather than to force features into the project area for the dam. Addressing water quality in the future phases will be more appropriate and easier due to the nature of the future work.

Finally, the regulations apply to the cumulative amount of disturbance on the project site (i.e. the golf course property), not the size of each individual project. The City will need to meet water quality standards once the combined impact of all of its projects to date exceeds one acre.

Comment: *To date, we have not seen the Hydraulic Study calculations required by MSD. When available these calculations should be independently checked for accuracy by another registered professional engineer, as well as the Storm Water Management Facilities Report.*

Response: The hydraulic calculations necessary for the design of the dam and its relief structure were performed by Intuition & Logic during the preliminary phase of the project. Intuition & Logic has several licensed professional engineers on staff to ensure the accuracy of their work. These findings were also submitted to MSD as part of the plan review process. City staff does not feel that an independent review of the hydraulic study is necessary.

Comment: *The 8' [reinforced concrete pipe (RCP)] entrance pipe to the Runnymede subdivision is sinking....To the question, "of what happens if it continues to sink?" the answer is "That is MSD's problem." is not satisfactory. You just do not build something with the abdication of responsibility for your design. This is not consistent with historical Creve Coeur standards.*

Response: This comment appears to stem from the staff response to Mr. Kent's comments from March 27, 2014, particularly comment #8.

The pipe in question is the 90" storm drain pipe that captures the water from both the golf course lakes and the east tributary. The initial plan involved reshaping the end of this pipe to remove the current vertical face, which amounts to about a 10-foot vertical drop. MSD's position was that any modification to the end of this pipe would require additional stormwater modeling into the Runnymede subdivision, and this would have unnecessarily increased the study area well beyond what impacts the dam.

MSD indicated that there would be no requirements regarding this pipe if it was left alone, so it appeared this would be a logical limit for the work.

In some way, as the owner of the pipe, this is MSD's problem. The City is not failing in its responsibilities by leaving this pipe for MSD to fix. There is a limit to what the City can do.

That said, MSD has just recently required that the project include a headwall for this end of the pipe. The City will end up fixing this problem through the project, but staff still does not want to expand the study area into the Runnymede subdivision and give any indication of a willingness to expand the project there.

Comment: *The reason I am so concerned about incorporating the overflow wier in to the dam is...what happens in a severe drought. The concrete expands and the clay shrinks. ... The clay shrinks and pulls away. ... Basically, this is why the dam failed in the first place.*

Response: The failure of the dam appears to be water finding its way along the sides of the existing spillway structure and gradually (over decades) eroding an increasingly large path around the spillway. This became a bypass for the spillway, and its presence was masked at the lake bank by a grouted rock face that held intact even though there were voids behind it. Animals burrowing in the bank wouldn't have helped the situation.

This was a gradual failure of the dam, but it showed itself in dramatic fashion in June 2013 when 5" of rain fell in an afternoon and the pressure forced the existing bank to collapse. Without the protective barrier of the grouted bank, and with the stormwater bypass still in place, the erosion of the rest of the bank and much of the dam was accelerated.

The proposal has the lake overflow structure set into the side of the dam. This area is typically quite wet, due to the adjacent pond, and ground shrinkage is of limited concern. If this was a dry basin, staff would be much more concerned about this proposal.

The proposal also includes several "seepage collars" that will be built along the pipe that will run beneath the dam. These are essentially concrete rings that deter water from running along the pipe and causing a similar situation as what caused the failure of the existing dam.



DEPARTMENT OF PUBLIC WORKS STAFF MEMORANDUM

DATE: October 24, 2013

TO: Mark Perkins, City Administrator

CC: Jim Heines, Director of Public Works

FROM: Matt Wohlberg, P.E., City Engineer
Kirsten Barnes, Director of Parks and Recreation

SUBJECT: Concept Improvements Recommendation
Dam, Detention Pond, and Channel Rehabilitation Project

Concept-level improvements to the southern detention lake and dam at the Creve Coeur Golf Course have been reviewed by the City's Stormwater Committee, Parks and Recreation Committee, and Planning and Zoning Commission. City staff presents the recommendation of these bodies to the Creve Coeur City Council for their review, as was discussed at the City Council meeting on August 12. Approval of a concept approach is the necessary next step in the design process.

Concept Development

The City hired a design team consisting of Intuition & Logic (engineering design), Geotechnology, Inc. (soil investigation and dam design), and SWT Design (landscape architecture) in August to review the issues at the lake and dam and to design improvements. City staff has had close coordination with the design team and with the City's Stormwater Committee and Parks and Recreation Committee since August to develop concept-level approaches to addressing the needs at and around the dam.

Alternatives Analysis. City staff met with the design team on September 4, 2013, to review the City's wants and needs so to determine the various design alternatives that would be reviewed in the development of a preliminary design for this site. The meeting produced a list of priorities for the repairs and improvements, which included:

1. Provide a long-term solution to the current issues.
2. Maintain or create a natural, native look with the improvements.
3. Limit future maintenance and operating costs.
4. Achieve and preserve better water quality for the ponds.

The design team used these basic priorities as a guide to develop the design elements described in the attached draft Alternatives Analysis Summary Memorandum. This memorandum provides a brief description of each of the various ideas for improvement brought forward in the design alternatives meeting and lists the costs and benefits of each design element. This memorandum also serves as the basis upon which several of the repair and enhancement options (discussed below) were developed.

Through the discussions at the alternatives development meeting, the various issues and improvements were separated into three general areas: 1.) the lower lake, dam, and channel; 2.)

the east channel; and 3.) the upper ponds. These three areas and the corresponding concerns are shown in the attached "Drainage System Overview" exhibit.

The design team and City staff agreed that the project will need to evaluate the needs of the surrounding area and the detention system as a whole rather than just the breach in the dam. However, the lower lake, dam, and channel were recognized as the area of highest priority due to the siltation of the southern lake, the breach in the dam, and the general failure of the concrete channel downstream of the dam. As such, the known future needs to remove silt from the lakes and to replace the golf cart bridge at the dam were also evaluated.

Improvement Concepts. The existing breach in the dam and the recognized need for silt removal in the lower lake could be addressed independently or as one project. These two issues could also be addressed using a functional approach or an approach that is more decorative. The combined consideration of these factors provided four apparent concepts for a project to improve the dam, provided below as options. Each of these options is illustrated by an attached conceptual sketch of that option's scope of work.

Each cost shown represents the estimated cost to complete the entire scope of the option. In other words, the anticipated cost of Option 2 is what is provided, not the sum of Options 1 and 2.

Option 1: Basic Dam and Channel Repair Estimated Cost: \$ 180,000

The most basic approach would be to address the most pressing need in a functional way. Replacing the dam will most likely require the replacement or modification of the outfall channel and the immediate area of the east channel as well, and this work has been incorporated into this basic repair.

The work involves the removal and replacement of the existing dam. The existing spillway would be replaced with a spillway and rock-lined outfall, a drop structure in the lake, or a combination of the two. The outfall and the affected length of the east channel would be lined with an appropriately sized limestone rock, and the east channel would be planted to re-establish a riparian corridor for that area.

Option 2: Enhanced Dam and Channel Repair Estimated Cost: \$ 210,000

An enhanced dam and channel repair would begin with the work outlined for Option 1 but would replace the limestone rock in the outfall and the east channel with ledge rock. Similar rock would be used to mask the spillway and to provide rock outcroppings for visual effect. Selected native plantings would be made throughout, but particularly at the rock outcroppings and along the east channel.

Option 3: Basic Dam, Channel, and Lake Improvements Estimated Cost: \$ 325,000

This option adds deepening the lake to the dam and channel repair from Option 1. The center of the lake would be excavated to provide a depth of 10' to 15' to remove the accumulated silt and to provide a depth that supports improved water quality.

Option 4: Enhanced Dam, Channel, and Lake Estimated Cost: \$ 440,000

This approach begins with the dam and channel improvements described for Option 2 and adds the deepening of the lake as described in Option 3. Wetland shelves, ledge rock along the east and west banks, and select plantings would be introduced to the lake. The purpose of these elements would be to provide a visual enhancement to the pond edge that would also provide a vegetative buffer for the lake and further opportunity to improve water quality in the lake.

Committee Review and Recommendation.

The Parks and Recreation Committee and the Stormwater Committee met jointly to review the situation and to evaluate the various options for improvements on both September 11, 2013, and September 25, 2013. Upon review of the options available and the costs associated with these options, the committees recommended that the City concentrate on the dam, channel, and southern lake, and to leave the upper ponds and the east channel as future projects. The two committees voted unanimously to support the enhancements and improvements to the dam, channel, and lake, as described above in Option 4.

The specific recommendation is included in a letter from Kevin Rejent, the Chairman of the Parks and Recreation Committee, which is attached for reference. Minutes from the September 25 joint-committee meeting are also included for reference.

The items involved with the committees' recommendation are also highlighted in the attached Alternatives Analysis Summary Memorandum. It should be noted that the recommended approach is only a concept and that it is too early in the design to know the actual requirements for the work. The applicability of specific measures is still unknown.

That said, the recommended approach provides the guidance needed to develop a design for improvements, particularly in terms of scope and scale. The work at the lake represents a significant portion of the recommended project, both in effort and in cost. Another important aspect of the recommended approach is that it basically defines the beautification desires for the area as more aesthetically pleasing versions of the necessary functional improvements to the area. In other words, enhancements are generally defined as decorative rock or plantings rather than a new waterfall at the nearby green.

Repairs to the dam, channel, and lake were considered together due to the heavy equipment involved and the anticipated need for restoration of the course following the work. With siltation removal for the lake identified in the capital plan for the 2017 fiscal year, it was understood that the removal of silt from the southern lake (i.e. adjacent to the dam embankment discussed here) would occur within the next few years. Separate projects to address the dam and lake would likely have similar mobilization, dewatering, and restoration costs and cause a similar disruption to the golf course. A single project was recommended to avoid duplicate costs and to limit the impact to the golf course.

Planning and Zoning Commission Recommendation

The conceptual improvement options were reviewed by the Planning and Zoning Commission on October 7, 2013, and on October 21, 2013. The Commission endorsed the committees' recommendation at the October 21 meeting. Minutes from this meeting and a letter from Tim Madden, the chairman of the Planning and Zoning Commission, are attached for reference.

The Planning and Zoning Commission also requested that City staff develop a long-term plan for improving the various issues that have been identified at the golf course. Such a plan is currently under review and is anticipated to be completed before the development of the next capital improvement plan.

Project Financing

The Capital Improvement Fund currently identifies \$150,000.00 annually for the design and construction of stormwater projects. The Stormwater Committee determined that the issues with the lakes and dam at the golf course represent the most pressing stormwater need in the City and recommended that the funds allocated in the 2014 fiscal year (as well as future years, as necessary) should be used to address this need.

Accordingly, funding for the design phase of the Dam, Detention Pond, and Channel Rehabilitation Project has been drawn from FY2014 stormwater capital account.

Construction is anticipated for the winter of 2013-2014, which will require additional funding during the 2014 fiscal year that will exceed the funds available. A budget adjustment will be required to fund the construction of the project, and this adjustment will be requested once a rehabilitation option has been designed and a more accurate cost of the work is known. At this point, staff expects that an additional \$375,000 - \$400,000 will be requested for this project.

Review of Stormwater Capital Fund. The current and future needs of the lakes and dam suggest a review of the capital funding allocated for stormwater projects is necessary. In addition to the design and construction funding required to address the issues related to the dam, channel, and lake, the City's five-year stormwater capital fund will be called on to fund the design and/or construction of two culvert replacements and siltation removal and other improvements to the northern lake at the golf course. Costs related to these projects will demand an average of approximately \$275,000 per year, far more than the \$150,000 identified. Therefore, a review of the budget outlay for stormwater improvements will be recommended as part of the development of the next five-year plan.

Recommendation

The City's Stormwater Committee, Parks and Recreation Committee, Planning and Zoning Commission, and staff recommend pursuit of repairs and improvements to the dam, southern lake, and channel that are intended to provide long-lasting, low-maintenance facilities that are visually appealing. This concept is best defined by Option 4 above. It is the shared opinion of the committees, the Commission, and staff that this repair should be viewed as an opportunity to enhance this area rather than simply repairing it.

It is also the recommendation of the committees, the Commission, and staff that the project involve improvements to both the lake and the dam, rather than to separate these two efforts. Combining the projects will facilitate the repairs and will reduce the impact on the golf course, both of which should be in the City's favor financially.

City staff requests that the City Council consider the apparent options and this recommendation so that the Council can provide staff with guidance as to which concept improvement should be used as a target for the design of the project.

Attachments: Photo Log of the dam breach
 Drainage System Overview Exhibit
 Draft Design Alternatives Analysis Memorandum (highlighted for emphasis)
 Existing Conditions Sketch
 Concept Sketches for Options 1, 2, 3, and 4
 Meeting Minutes from Joint-Committee Meeting on September 25, 2013
 Parks and Recreation Committee Letter, dated September 27, 2013
 Planning and Zoning Commission Minutes Excerpt from October 21, 2013
 Planning and Zoning Commission Letter, dated October 24, 2013



Photo 1: The initial breach of the dam occurred along the side of the spillway. (The spillway wall is the closest of the concrete walls shown here.) The top foot of the detention pond drained out through the breach, which began at the bottom right corner of the photo. Note the grouted rock lining of the dam is shown collapsed into the breach. It was apparently hollow underneath and hid the issue from view.



Photo 2: A view of the dam and spillway during the repair of the first breach. Note that the lake was drained an additional foot to reduce flow through the breach and the additional erosion that would cause.

The second breach occurred immediately to the left of this repair.



Photo 3: On top of the dam, looking south from the cart path. The June 17 storm re-opened the breach in the dam and exposed a significant hole in the dam. Water is using this route as its path. The concrete channel (i.e. where the water should be flowing) begins at the right side of the photo, and the side wall shown is completely undermined. The hole shown here is more than six feet deep and extends back under the cart path.



AREA 1: DAM, CHANNEL, AND SOUTH LAKE

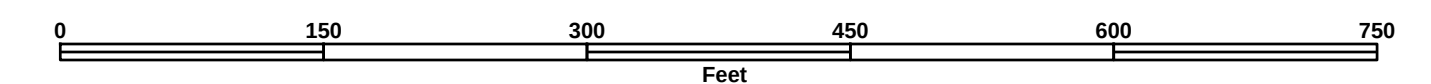
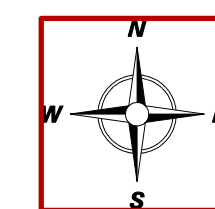
- REPAIR FAILED DAM
- REPLACE CONCRETE CHANNEL
- REPLACE GABION BASKETS
- REMOVE SILT FROM SOUTH LAKE
- EVALUATE AND IMPROVE LAKE CAPACITY
- IMPROVE SHORELINE AESTHETICS
- IMPROVE WATER QUALITY
- EVALUATE AND REVITALIZE CHANNEL
- REVIEW CART PATH LAYOUT
- REPLACE EXISTING BRIDGE(S)

AREA 2: EAST CHANNEL

- EVALUATE CHANNEL PERFORMANCE
- ADD RAILINGS TO EXISTING BRIDGE
- REPLACE RETAINING WALL AT TEE BOX

AREA 3: NORTHERN LAKES

- DETERMINE FLOW AND STORAGE NEEDS
- EVALUATE NORTHERN LAKE AS FOREBAY
- REPLACE GABION SHORELINE
- MINIMIZE SILT ENTERING SYSTEM



DRAINAGE SYSTEM OVERVIEW - CREVE COEUR GOLF COURSE

Alternatives Analysis Summary Memorandum

To: City of Creve Coeur, Missouri
By: Mark Meyer, PE
Date: 09-25-2013
Re: Creve Coeur Dam and Channel

OBJECTIVE:

The objectives of the Alternatives Analysis are:

1. Identify the City's design goals and objectives for this project.
2. Identify Alternative Design Elements acceptable to the City to achieve design goals and objectives.
3. Provide concept images for each Alternative Design Element.
4. Provide opinion of probable construction cost for each Alternative Design Element.
5. Summarize Alternative Design Elements and costs to address each design component.

APPROACH:

Intuition & Logic's (I&L) approach to achieving the Alternatives Analysis is as follows:

1. Geotech site visit to assess dam and spillway for information during Alternatives Analysis Meeting.
2. I&L to develop preliminary Hydrologic and Hydraulic calculations for all ponds and east channel for use during Alternatives Analysis Meeting.
3. Hold Alternatives Analysis Meeting with City Officials and Design Team to discuss City goals, objectives and potential Alternative Design Elements.
4. Develop ideas identified at the Alternatives Meeting into design alternatives.
5. Develop opinions of probable construction costs for each Alternative Design Element.
6. Obtain concept photos illustrating the possible finished look of each Alternative Design Element.
7. Summarize the Alternatives and Costs in an Alternatives Analysis Summary Memorandum.

RESULTS:

Hydrology

The following table contains the flow rates and watershed information from the Hydrologic analysis. The final design elements will be designed to accommodate the appropriate storm events. Storm Events are designated by the flowrate in cubic feet per second (cfs) associated with the storm frequency (eg. 100 year, 24 hour storm (Q100)):

	Pond	East Channel
Drainage Area	114.9 Acres	71.8 Acres
CN	88	81
Tc	30.0 Min	17.4 Min
Q1 flowrate	144 cfs	76 cfs
Q2 flowrate	199 cfs	115 cfs
Q5 flowrate	218 cfs	128 cfs
Q10 flowrate	307 cfs	194 cfs
Q25 flowrate	450 cfs	305 cfs
Q50 flowrate	547 cfs	381 cfs
Q100 flowrate	585 cfs	411 cfs

*no design has been completed yet, flow rates are provisional and are intended to aid in development of order of magnitude cost estimates

The flow rates do not reflect flow attenuation or storage from the existing ponds.

Alternatives Analysis Meeting

An alternatives analysis meeting was held on September 4th, 2013 with the following City of Creve Coeur and design team members in attendance:

Jim Heines – City of Creve Coeur	Dennis Boll - Geotechnology
Matt Wohlberg – City of Creve Coeur	Tim Dean – I&L
Kirsten Barnes – City of Creve Coeur	Mark Meyer – I&L
Mark Perkins – City of Creve Coeur	Laura Barrett – SWT
Klaus-Dieter Rausch – SWT	

The meeting discussions were focused on three potential project areas:

1. Lower Pond, Dam and Lower Channel Area – this area includes the lower pond, dam, spillway, lower channel from the spillway to the 60" pipe culvert, the bridge across the existing spillway, the bridge across the east channel about 80 feet upstream of the confluence and the lower 80 feet of the east channel from the bridge to the confluence.

2. Upper Ponds Area – this area includes the 3 ponds north of the Lower Pond.
3. East Channel Area – this area includes the east channel from the bridge (80 ft upstream of the confluence) to the culvert outfall from residential neighborhood immediately east of the golf course.

The design goals and objectives were discussed for each of the three project areas and alternatives to meet the objectives were identified. A total of 19 design objectives and 33 Alternative Design Elements were identified for the 3 project areas.

17 potential Alternative Design Elements were identified to address 9 design objectives for the Lower Pond, Dam and Lower Channel Area. The following Tables contain the identified design objectives and Alternative Design Elements for the Lower Pond, Dam and Lower Channel Area:

LOWER POND, DAM AND LOWER CHANNEL AREA OBJECTIVES AND ALTERNATIVES													
Alternative	Design Objective	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
		Fix Dam Piping Issue	Improve Spillway Aesthetic	Improve Channel Aesthetic	Improve Pond Water Quality	Improve Flooding	Keep upper access for walkers	Keep mature trees on golf course	Address Algae Problem in Pond	Discourage Golfers from Entering Pond	Improving lower pond aesthetic	Removal of accumulated silt in ponds	Sustainable , low-maintenance-cost improvements
1. *Remove Existing Concrete Spillway		X	X								X		X
2. *Remove Existing Concrete Channel		X	X	X							X		X
3. *Remove Bridge over lower Channel				X									
4. *Natural Boulders Pond Outfall		X	X								X		X
5. *OPTION - Drop Structure and Pipe instead of Boulder Pond Outfall		X											X
6. *Rebuild Dam		X											
7. *Remove Bridge over East Channel						X							
8. *Boulder and Rock Lower Channel				X		X					X		X
9. *Flood Benching, Multi-Tier Lower Channel				X		X			X		X		
10. *Cart Path on Dam							X						
11. Replace Bridge over Channel				X									
12. Circulating Boulder Water Fall Pond Outfall					X				X		X		
13. Circulating Waterfall off East Side of #5 Green					X				X		X		
14. Bubbler System (solar with electric backup)					X				X		X		
15. Deep Pond Center (10'-15')					X				X		X	X	X
16. Wetland Shelves					X				X	X	X	X	X
17. Filter and Buffer Vegetation at Pond Edge					X				X	X	X		X
18. Boulder Pond Edge										X			
19. Boulder edge with drop area at #5 green										X			

* Combined in base approach

It is by LOGIC that we prove
but by INTUITION that we discover

6 potential Alternative Design Elements were identified to address 3 design objectives for the Upper Pond Area. The following Tables contain the identified design objectives and Alternative Design Elements for the Upper Ponds Area:

UPPER PONDS AREA OBJECTIVES AND ALTERNATIVES			
Alternative	Design Objective	1. Improve Water Quality In Ponds	2. Improve Aesthetics of Pond Edge
1. Dredge – 10'-15' deep center		X	X
2. Dredge – 6' depth		X	
3. HDS @ Olde Cabin Road		X	X
4. Remove rip-rap on Pond 2 & 3 w/ vegetation to water		X	X
5. Remove rip-rap on Pond 2 & 3 w/boulder edge			X
6. Meadow @ end of #6 fairway			X

10 potential Alternative Design Elements were identified to address 7 design objectives for the East Channel Area. The following Tables contain the identified design objectives and Alternative Design Elements for the East Channel Area:

EAST CHANNEL AREA OBJECTIVES AND ALTERNATIVES								
Alternative	Design Objective							
	1. Low Vegetation at Approach to #3 Green	2. Low Vegetation in front of #4 Tee	3. Remove Invasive Species Along Channel	4. Fix Retaining Wall at #4 Tee	5. Improve Channel Crossing at #4 Tee	6. Replace Cart Path Along Channel	7. Replace #3 Bridge to Match Others	8. Improve Channel aesthetics
1. Boulder Edge Channel at #3	X	X						X
2. Boulder Edge Channel at #4	X		X					X
3. Restore Channel from #4 bridge to Lower Pond Project	X	X						X
4. Near #5 eliminate honey suckle and re-vegetate	X		X					X
5. Replace #4 retaining wall with MBW				X				X
6. Replace #4 retaining wall with Boulder Wall				X				X
7. Replace Culvert Crossing at #4					X			X
8. Replace cart path along Channel from #3 to #5						X		X
9. Replace bridge at #3 to match others							X	X
10. Circulating Boulder Water Fall Pond Outfall								X

Construction Cost Opinion

An order of magnitude opinion of probable construction cost was developed for each Alternative Design Element. Cost opinions are based on local bid tab databases and recent project experience for similar construction. The cost opinions are presented in 2013 dollars and intended for use in establishing budgeted ranges for potential future projects.

The first 10 lower pond Alternative Design Elements were combined as the base design. This base design will remove the existing dam, spillway, channel, short bridge over lower channel, and associated concrete on the east channel as well as remove the existing bridge over the east channel. The dam, spillway and lower channel will be replaced using a natural boulder look or a drop structure and pipe. The existing cart path over the spillway will also be replaced. This base option will address the current need to replace the degraded and leaking dam, spillway and lower concrete channel and restore cart access to the #5 green. The following tables provide the construction cost opinion for the base project and each Alternative Design Element:

DAM AND CHANNEL BASE PROJECT					
Area	Alternative	Unit	Quantity	Unit Cost	Sub Total
Lower Pond	Remove Existing Concrete Spillway	LUMP	1	\$1,000	\$ 1,000
Lower Pond	Remove Existing Concrete Channel	LUMP	1	\$10,000	\$ 10,000
Lower Pond	Remove Bridge over lower Channel	LUMP	1	\$1,000	\$ 1,000
Lower Pond	Remove Bridge over East Channel	LUMP	1	\$1,000	\$ 1,000
Lower Pond	Rebuild Dam Embankment	CY	800	\$50	\$ 40,000
Lower Pond	*Natural Boulders Pond Outfall	SF	500	\$50	\$ 25,000
Lower Pond	*OPTIONAL - Drop Structure and Pipe instead of Boulder Pond Outfall (these two options are treated as mutually exclusive)	Lump	1	\$40,000	\$ 40,000
Lower Pond	Boulder and Rock Lower Channel	LF	100	\$600	\$ 60,000
Lower Pond	Flood Benching, Multi-Tier Lower Channel	CY	800	\$35	\$ 28,000
Lower Pond	Cart Path on Dam	LF	200	\$50	\$ 10,000
Subtotal (drop structure option) =					\$ 196, 000
Subtotal (boulder outfall option) =					\$ 206,000

* Represents an either/or alternative item

The following table presents the remaining Alternative Design Elements (base project removed):

COST OPINIONS BY ALTERNATIVES					
Area	Alternative	Unit	Quantity	Unit Cost	Sub Total
Lower Pond	Replace Bridge over Channel	LF	30	\$ 1,000	\$ 30,000
Lower Pond	Circulating Boulder Water Fall Pond Outfall	LUMP	1	\$ 75,000	\$ 75,000
Lower Pond	Circulating Waterfall off East Side of #5 Green	LUMP	1	\$ 125,000	\$ 125,500
Lower Pond	Bubbler System (solar with electric backup)	LUMP	1	\$ 15,000	\$ 15,000
Lower Pond	Deep Pond Center (10'-15')	CY	1,300	\$ 100	\$ 130,000
Lower Pond	Wetland Shelves	SY	330	\$ 35	\$ 11,550
Lower Pond	Filter and Buffer Vegetation at Pond Edge	SY	1,450	\$ 10	\$ 14,500
Lower Pond	Boulder Pond Edge	SF	800	\$ 100	\$ 80,000
Lower Pond	Boulder edge with drop area at #5 green	LF	100	\$ 50	\$ 5,000
Upper Ponds	Dredge – 10'-15' deep center	CY	2,400	\$ 100	\$ 240,000
Upper Ponds	Dredge – 6' depth	CY	700	\$ 100	\$ 70,000
Upper Ponds	HDS @ Olde Cabin Road	LUMP	1	\$ 100,000	\$ 100,000
Upper Ponds	Remove rip-rap on Pond 2 & 3 w/ vegetation to water	SY	1,600	\$ 30	\$ 48,000
Upper Ponds	Remove rip-rap on Pond 2 & 3 w/boulder edge	SF	1,000	\$ 75	\$ 75,000
Upper Ponds	Meadow @ end of #6 fairway	SY	4,000	\$ 10	\$ 40,000
East Channel	*Boulder Edge Channel at #3	LF	130	\$ 300	\$ 39,000
East Channel	*Boulder Edge Channel at #4	LF	130	\$ 300	\$ 39,000

It is by LOGIC that we prove
but by INTUITION that we discover

COST OPINIONS BY ALTERNATIVES					
Area	Alternative	Unit	Quantity	Unit Cost	Sub Total
East Channel	*Restore Channel from #4 bridge to Lower Pond Project	LF	200	\$ 300	\$ 60,000
East Channel	*Near #5 eliminate honey suckle and re-vegetate	Acre	0.5	\$ 30,000	\$ 15,000
East Channel	*Replace #4 retaining wall with MBW	SF	900	\$ 25	\$ 22,500
East Channel	Replace #4 retaining wall with Boulder Wall	SF	900	\$ 50	\$ 45,000
East Channel	*Replace Culvert Crossing at #4	LUMP	1	\$ 10,000	\$ 10,000
East Channel	Replace cart path along Channel from #3 to #5	LF	500	\$ 50	\$ 25,000
East Channel	Replace bridge at #3 to match others	LF	40	\$ 1,000	\$ 40,000

Alternative Design Elements

The following pages present concept photos, data and cost information for each of the Alternative Design Elements.

Alternative Design Element: Natural Boulders Pond Outfall.
(Estimated Cost - \$25,000)

Design Objective(s): Fix Dam Piping Issue, Improve Spillway Aesthetic

Area: Base Approach Item, Lower Pond

Description: The emergency spillway for the pond is constructed using natural boulders and ledge rock to create the cascading aesthetic of a waterfall during flow events.

Unit Cost: \$50 per square foot of boulder face. Unit cost includes excavation, grading, and boulder element construction.



Alternative Design Element: Drop Structure and Pipe Pond Outfall.
(Estimated Cost - \$40,000)

Design Objective(s): Fix Dam Piping Issue

Area: Alternative to Base Approach Item of “*Natural Boulders Pond Outfall*” - Lower Pond

Description: Stand pipe drop structure and pipe flow under the dam

Unit Cost: \$40,000 Lump



Alternative Design Element: Boulder and Rock Lower Channel.
(Estimated Cost - \$60,000)

Design Objective(s): Improve Flooding, Improve Channel Aesthetic

Area: Base Approach Item - Lower Pond

Description: The channel below the pond outfall is stabilized and restored with rock enhancements, improving stream channel stability and hydraulic function.

Unit Cost: \$600 per linear foot. Unit cost includes excavation, grading, rock structure construction and re-vegetation.



It is by LOGIC that we prove
but by INTUITION that we discover

Alternative Design Element: Flood Benching, Multi-tier lower channel (Estimated Cost - \$40,000)

Design Objective(s): Improve Flooding, Improve Channel Aesthetic

Area: Base Approach Item - Lower Pond

Description: Flood Benches are an alternative to a trapezoidal channel below the pond spillway. The flood benches are terraces constructed on both sides of the channel below the pond outfall adding hydraulic capacity and storage to the channel.

Unit Cost: \$35 per cubic yard of excavation. Unit cost includes excavation, grading, and re-vegetation. Unit cost does not include boulders (this cost is included in the channel cost)



Alternative Design Element: Cart Path on Dam. (Estimated Cost - \$10,000)

Design Objective(s): Maintain access to #5 Green for walkers, replace cart path along east channel

Area: Base Approach Item - Lower Pond, East Channel

Description: Remove and replace the existing cart path and base and replace it with a 4" compacted base and 4" thick 6' wide asphalt trail.

Unit Cost: \$50.00 per linear foot



Alternative Design Element: Circulating Boulder Waterfall Pond Outfall. (Estimated Cost - \$75,000; representing an additional \$50,000 of cost when compared to the estimated cost of the “*Natural Boulders Pond Outfall*”)

Design Objective(s): Improves Spillway Aesthetic, Improves Channel Aesthetic, Improve Pond Water Quality, Address Algae Problem in Pond

Area: Alternative Item to Base Approach Item of “*Natural Boulders Pond Outfall*” - Lower Pond

Description: A pond water pump system is added to the boulder spillway and channel to create a steady flow of water re-circulated across the spillway, creating a persistent cascading aesthetic of a waterfall. This Alternative Design Element increases aesthetics of the spillway and channel while also improving water quality by pumping the newly oxygenated water back into the pond. The waterfall is not as effective as a bubbler system at oxygenating the pond.

Unit Cost: Lump sum - \$75,000



It is by LOGIC that we prove
but by INTUITION that we discover

Alternative Design Element: Circulating Waterfall off east side of the #5 Green. (Estimated Cost - \$125,000)

Design Objective(s): Improve Pond Water Quality, Address Algae Problem in Pond

Area: Optional Additional Item - Lower Pond

Description: Natural ledge rock and boulders are used to create a waterfall east of the 5th green, by using the rocks and boulders to establish a persistent upper pool of water into which water is constantly pumped from the lower pond, creating a waterfall. This Alternative Design Element has the benefit of increasing water circulation within the lower pond, thereby increasing oxygen levels and maintaining a more consistent water temperature throughout the full depth of the water. The waterfall is not as effective as a bubbler system at oxygenating the pond.

Unit Cost: Lump sum - \$125,000



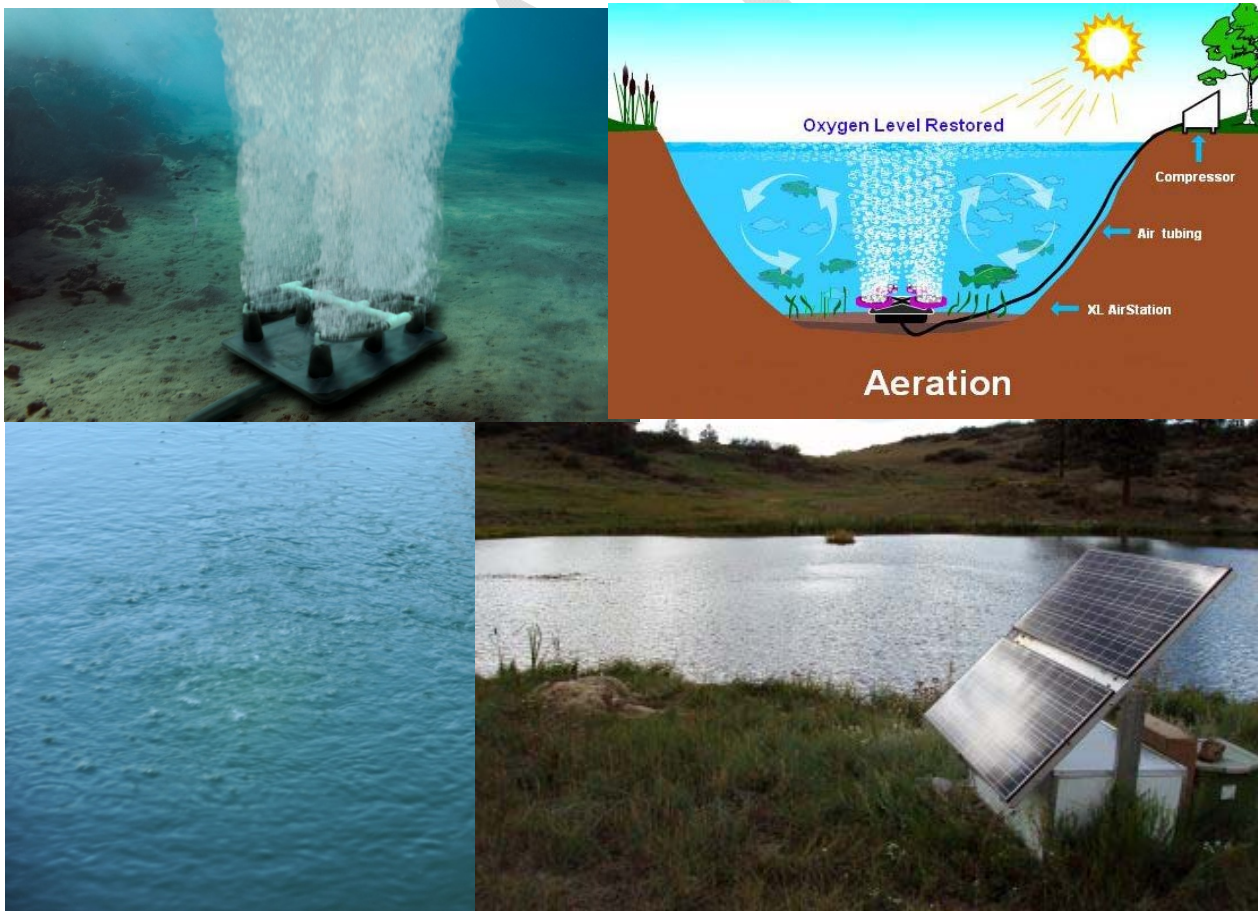
Alternative Design Element: Bubbler system [solar powered with electric back-up]. (Estimated Cost - \$15,000)

Design Objective(s): Improve Pond Water Quality, Address Algae Problem in Pond

Area: Optional Additional Item - Lower Pond

Description: A forced air system, utilizing a solar-powered pump with electrical back-up is used to provide aeration and water circulation within the pond. This Alternative Design Element has the benefit of increasing water circulation within the lower pond, thereby increasing oxygen levels and maintaining a more consistent water temperature throughout the full depth of the water. The bubbler system is the most effective method to oxygenate the pond water.

Unit Cost: Lump sum - \$15,000 includes Air compressor, solar power supply, hosing, diffuser, electrical connection and installation.



Alternative Design Element: Deep pond center (dredging to a depth of 6' or 10-15').

(Estimated Cost - \$370,000 for all three ponds)

Design Objective(s): Improve Pond Water Quality, Address Algae Problem in Pond

Area: Optional Additional Item - Lower Pond and Upper Ponds

Description: The pond bathymetry is increased through dredging excess sediments from the pond bed. Increases the depth of the pond, increasing total water volume, improving water temperatures, providing thermal refugia for desired fish species, and removes portions of the pond bed from the photic zone preventing nuisance vegetation and algae from directly accessing the excess nutrients available within while allowing naturally, occurring beneficial aerobic and anaerobic bacteria to complete the natural nutrient fixation process with direct competition from algae.

Unit Cost: \$100 per cubic yard includes dredging of pond bed and offsite disposal of spoils.



Alternative Design Element: Filter and Buffer Vegetation at Pond Edge/ Wetland Shelves. (Estimated Cost - \$26,000)

Design Objective(s): Improve Pond Water Quality, Address Algae Problem in Pond, Discourage Golfers from Entering Pond

Area: Optional Additional Item - Lower Pond

Description: A buffer strip of vegetation is established along the shore of the pond, within which aesthetically pleasing plantings of vegetation are established. Serving to trap and treat incoming nutrients and sediments before they enter they are able to enter the pond and become available for use by nuisance algae and aquatic plants, while serving to create a distinct boundary around the ponds shoreline and barrier to entry into the pond.

Unit Cost: \$10 per square yard; includes grubbing the area of existing vegetation, preparing the planting surface and planting plugs and establishing seed.



Alternative Design Element: Boulder Pond Edge and Boulder Pond Edge with drop area at #5 Green. (Estimated Cost - \$5,000)

Design Objective(s): Discourage Golfers from Entering Pond

Area: Upper ponds and Lower Pond

Description: A two foot drop to the water surface is created by lining the pond edge with natural boulders and ledge rock. Creating a vertical barrier to pond entry.

Unit Cost: \$50 per linear foot of face; includes excavation, grading and boulder pond edge construction.



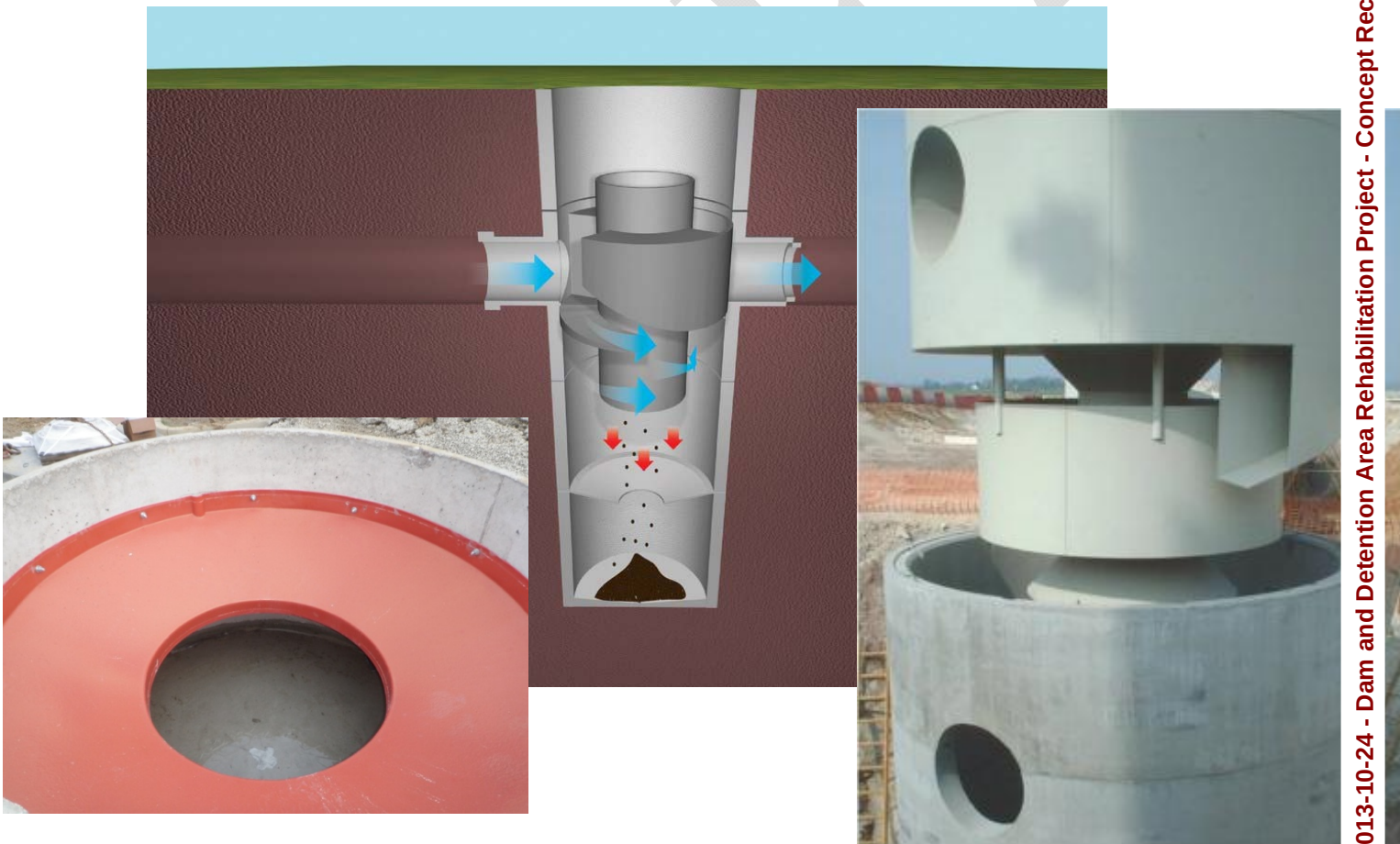
Alternative Design Element: Hydro-Dynamic Separator Unit.
(Estimated Cost - \$100,000)

Design Objective(s): Improve Water Quality in Ponds

Area: Optional Additional Item - Upper Ponds and Lower Pond

Description: A series of pre-cast concrete structures is used to create a swirling vortex of water, which in combination with a sump creates a sediment and pollutant trap in which pollutants with low-densities (oil byproducts and suspended organics) are collected in the upper chamber while sediments are trapped within the sump.

Unit Cost: \$100,000 Lump Sum, includes the necessary HDS units, fittings, piping, excavation, installation and grading.



Alternative Design Element: Remove Rip-Rap, replace with vegetation to pond edge. (Estimated Cost - \$48,000)

Design Objective(s): Improve Aesthetics of Pond Edge

Area: Optional Additional Item - Upper Ponds

Description: Rip-rap is removed from the shore lines of the upper ponds and replaced with a vegetated edge.

Unit Cost: \$30 per square yard; includes removal and disposal of rip-rap, grading and planting of vegetation.



Alternative Design Element: Remove Rip-Rap, replace with boulder edge. (Estimated Cost - \$75,000 representing an additional \$27,000 of cost when compared to the estimated cost of the “*Natural Boulders Pond Outfall*”)

Design Objective(s): Improve Aesthetics of Pond Edge

Area: Optional Additional Item - Upper Ponds

Description: Rip-rap is removed from the shore lines of the upper ponds and replaced with a boulder pond edge.

Unit Cost: \$75 per square foot of face; includes removal and disposal of rip-rap, grading and construction of boulder edge.



Alternative Design Element: Meadow at end of #6 Fairway.
(Estimated Cost - \$40,000)

Design Objective(s): Improve Aesthetics of Pond Edge, Address Wet Area at end of #6 Fairway

Area: Optional Additional Item - Upper Ponds

Description: The existing wet area / seep is planted with a host of site appropriate grass and forb species with a mowed edge.

Unit Cost: \$10 per square yard; includes grading, planting area preparation and planting of containerized, plug and seed.



Alternative Design Element: Boulder Edge Channel at #3 and #4.
(Estimated Cost - \$78,000)

Design Objective(s): Low Vegetation at #3 and #4

Area: Optional Additional Item - East Channel

Description: The east channel is restored and stabilized using a boulder edge channel.

Unit Cost: \$300 per linear foot; includes excavation grading, and planting of containerized, plug and seed.



Alternative Design Element: Restore Channel from #4 Bridge to Lower Pond. (Estimated Cost - \$60,000)

Design Objective(s): Remove Invasive Species Along Channel

Area: Optional Additional Item - East Channel

Description: The channel between the #4 fairway bridge and the lower pond is restored with invasive vegetation removed.

Unit Cost: \$300 per linear foot; includes excavation grading, and planting of containerized, plug and seed.



Alternative Design Element: Replace #4 Retaining Wall with Modular Block Retaining Wall. (Estimated Cost - \$22,500)

Design Objective(s): Fix Retaining Wall at #4

Area: Optional Additional Item - East Channel

Description: The retaining wall at the #4 tee box is replaced with a modular block retaining wall.

Unit Cost: \$25 per square foot; includes removal and disposal of existing retaining wall grading, and construction of new retaining wall.



Alternative Design Element: Replace #4 Retaining Wall with Boulder Retaining Wall. (Estimated Cost - \$45,000 representing an additional \$20,000 of cost when compared to the estimated cost of the “*Retaining Wall with Modular Block Retaining Wall*”)

Design Objective(s): Fix Retaining Wall at #4

Area: Optional Additional Item - East Channel

Description: The retaining wall at the #4 tee box is replaced with a boulder wall.

Unit Cost: \$50 per square foot; includes removal and disposal of existing retaining wall grading, and construction of new retaining wall.



Creve Coeur Dam and Channel
Creve Coeur, St Louis County, Missouri

EVE COOL BALL and CHALLINOR
Crows Court, St. Louis County, Missouri

THE PROFESSIONAL WHOSE SIGNATURE AND PERSONAL SEAL APPEAR HEREON ASSUMES RESPONSIBILITY ONLY FOR WHAT IS SHOWN ON THIS PAGE, AND DISCLAIMS (PURSUANT TO SECTION 327.411 RSMO) ANY RESPONSIBILITY FOR ALL OTHER PLANS, SPECIFICATIONS, ESTIMATES, REPORTS, OR OTHER DOCUMENTS OR INSTRUMENTS NOT SEALED AND SIGNED OR UNDERSIGNED PROFESSIONAL. THIS DOCUMENT IS NOT INTENDED TO BE USED FOR ANY OTHER PARTS OF THE PROJECT TO WHICH IT REFERS.

Professional Engineer
Mark Edward Mey
2000150043

Expiration Date: Dec. 31

Rev	Date	Description

Project No. 1207

Designed: TPD

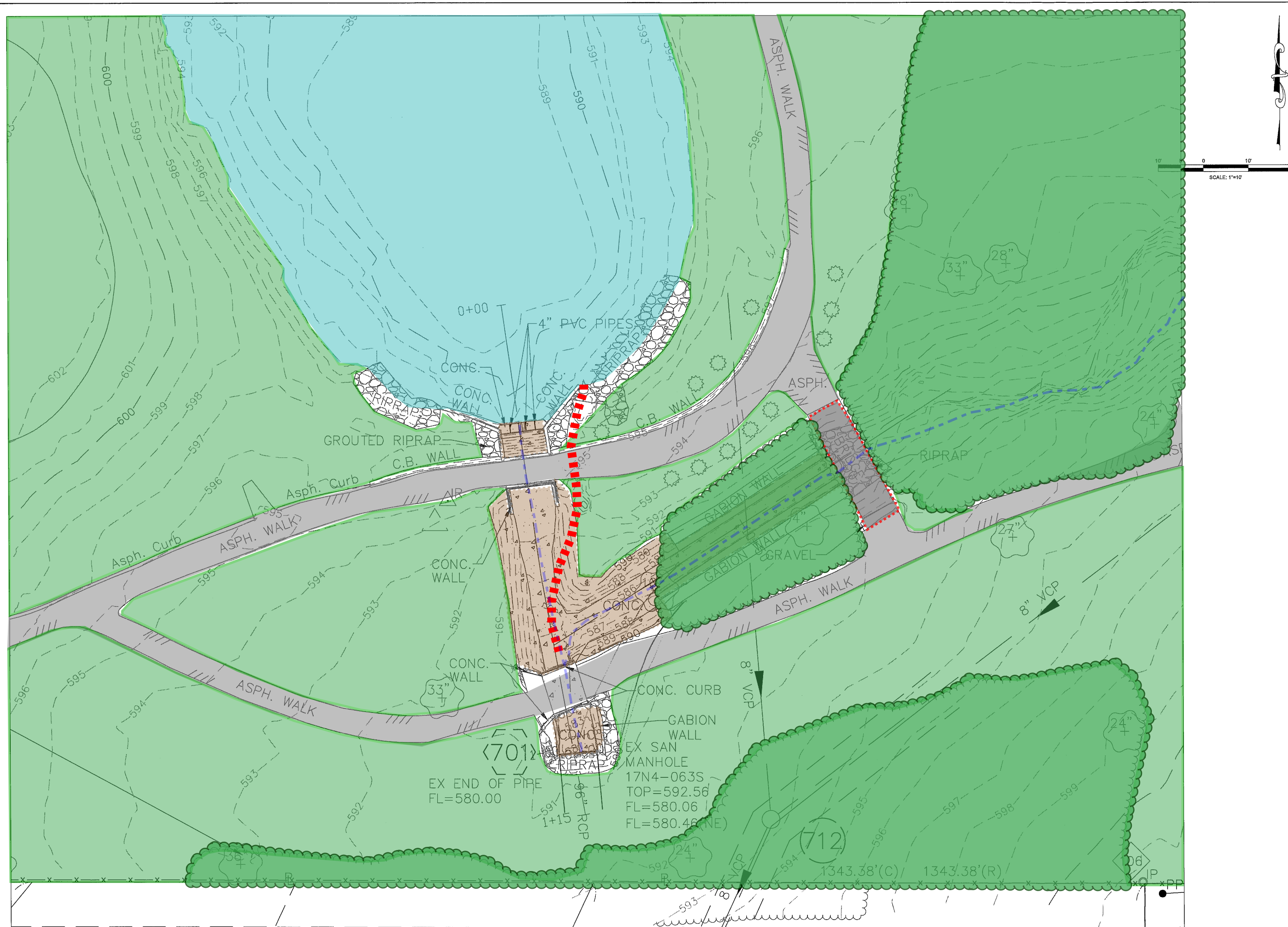
Drawn: AMO

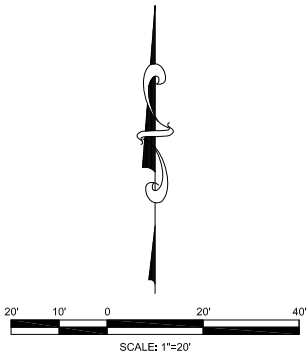
Checked: TPD

Approved: MEM

Sheet Title:

Sheet Number





OPTION 1: BASIC DAM AND CHANNEL

Remove the existing dam and spillway and construct a new earthen dam and a concrete box culvert for a spillway. Line the outfall path and the reconfigured east channel with limestone rock. Include plantings in east channel to restore a riparian corridor.

- A** New dam with re-routed cart path
- B** Box culvert spillway
- C** Outfall lined with limestone rock
- D** East channel re-aligned and lined with limestone
- E** Modular block wall at pipe entrance
- F** Existing 96" pipe

ESTIMATED COST: \$180,000



ILINC Engineering Incorporated
MO Certificate of Authority
2000152987
16253 Swingley Ridge Rd.
Suite 100
Chesterfield, MO 63017
Phone (636) 777-3000
Fax (314) 432-5812

Creve Coeur Dam and Channel

Creve Coeur, St Louis County, Missouri

THE PROFESSIONAL WHOSE SIGNATURE, PERSONAL SEAL, AND EXPIRATION DATE ARE REQUIRED FOR THIS PROJECT, HAS REVIEWED THE PROJECT AND ACCEPTS RESPONSIBILITY ONLY FOR WHAT APPEARS ON THIS PAGE, AND DISCLAIMS (PURSUANT TO SECTION 171.411 RSMO) ANY RESPONSIBILITY FOR ALL OTHER PLANS, SPECIFICATIONS, ESTIMATES, REPORTS, OR OTHER DOCUMENTS OR INSTRUMENTS NOT SEALED BY OR INTENDED TO BE USED FOR ANY PARTS OF THE PROJECT TO WHICH THIS REFERS.

Professional Engineer Seal
Mark Edward Meyer
2000150043

Expiration Date: Dec. 31, 2014

Rev	Date	Description
1	10/15/13	Initial Design
2	10/15/13	Final Design
3	10/15/13	Construction
4	10/15/13	As-Built

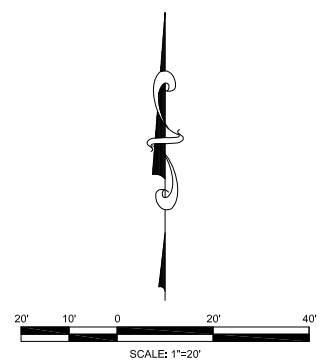
Project No. 1311
Designed: TPD
Drawn: JDF
Checked: TPD
Approved: MEM
Sheet Title:

PLAN AND PROFILE

Sheet Number:

004_CREVE_COEUR_PLAN_PROFILE

Path: P:\1311 - Creve Coeur Dam and Channel\CAD\plans
Plotted on: 10/15/13 @ 6:44 PM by ---



OPTION 2: ENHANCED DAM AND CHANNEL

Remove the existing dam and spillway and construct a new earthen dam and a concrete box culvert for a spillway. Line the outfall path and the reconfigured east channel with ledge rock or similar as necessary. Mask the spillway with ledge rock and place ledge rock throughout the area for aesthetic enhancements. Include selected native plantings in east channel and at rock outcroppings.

- A** New dam with re-routed cart path
- B** Box culvert spillway with ledge rock masking
- C** Outfall lined with ledge rock
- D** East channel re-aligned and lined with ledge rock
- E** Ledge rock wall at pipe entrance
- F** Existing 96" pipe
- G** Ledge rock outcropping

ESTIMATED COST: \$210,000



ILINC Engineering Incorporated
MO Certificate of Authority
2000152987
16253 Swingley Ridge Rd.
Suite 100
Chesterfield, MO 63017
Phone (636) 777-3000
Fax (314) 432-5812

Creve Coeur Dam and Channel
Creve Coeur, St Louis County, Missouri

THE PROFESSIONAL WHOSE SIGNATURE, PERSONAL SEAL AND EXPIRATION DATE ARE REQUIRED FOR THIS PROJECT, HAS REVIEWED THIS PLAN AND ASSURES THAT IT COMPLIES WITH THE REQUIREMENTS OF THE MISSOURI PROFESSIONAL ENGINEERING ACT AND THE MISSOURI PROFESSIONAL SURVEYING ACT. ANY PART OF THIS PROJECT TO WHICH THIS PLAN REFERS, IS THE PROPERTY OF THE PROFESSIONAL ENGINEER OR SURVEYOR AND IS NOT TO BE REPRODUCED OR USED FOR ANY OTHER PROJECT WITHOUT THE WRITTEN PERMISSION OF THE PROFESSIONAL ENGINEER OR SURVEYOR.

Professional Engineer Seal
Mark Edward Meyer
2000150043

Expiration Date: Dec. 31, 2015

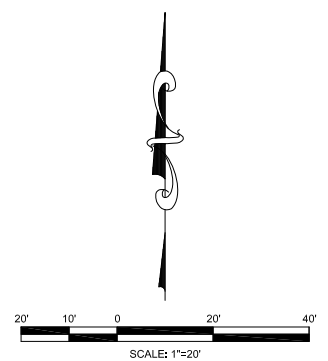
Rev	Date	Description
1	10/15/13	Initial Design
2	10/15/13	Final Design
3	10/15/13	As-Built
4	10/15/13	Final As-Built

Project No. 1311
Designed: TPD
Drawn: JDF
Checked: TPD
Approved: MEM
Sheet Title:

PLAN AND PROFILE

Sheet Number:

004_CREVE_COEUR_PLAN_PROFILE
Path: P:\1311 - Creve Coeur Dam and Channel\CAD\plans
Plotted on: 10/15/13 @ 6:44 PM by ---



OPTION 3: BASIC DAM, CHANNEL, AND LAKE

Remove the existing dam and spillway and construct a new earthen dam and a concrete box culvert for a spillway. Line the outfall path and the reconfigured east channel with limestone rock. Include plantings in east channel to restore a riparian corridor. Excavate silt and pond base to create a deep center channel.

- A** New dam with re-routed cart path
- B** Box culvert spillway
- C** Outfall lined with limestone rock
- D** East channel re-aligned and lined with limestone
- E** Modular block wall at pipe entrance
- F** Existing 96" pipe
- G** Excavate silt to create deep (15') channel

ESTIMATED COST: \$325,000



ILINC Engineering Incorporated
MO Certificate of Authority
2000152987
16253 Swingley Ridge Rd.
Suite 100
Chesterfield, MO 63017
Phone (636) 777-3000
Fax (314) 432-5812

Creve Coeur Dam and Channel
Creve Coeur, St Louis County, Missouri

THE PROFESSIONAL WHOSE SIGNATURE, PERSONAL SEAL AND EXPIRATION DATE ARE REQUIRED FOR THIS PAGE, AND DISCLAIMS (Pursuant to Section 171.411 RSMo) ANY RESPONSIBILITY FOR ALL OTHER PLANS, SPECIFICATIONS, REPORTS, OR OTHER DOCUMENTS OR INSTRUMENTS NOT SEALED BY OR INTENDED TO BE USED FOR ANY PARTS OF THE PROJECT TO WHICH IT REFERS.

Professional Engineer Seal
Mark Edward Meyer
2000150043

Expiration Date: Dec. 31, 2014

Rev	Date	Description
1	10/15/13	Initial Design
2	10/15/13	Final Design
3	10/15/13	Construction
4	10/15/13	As-Built

Project No. 1311
Designed: TPD
Drawn: JDF
Checked: TPD
Approved: MEM
Sheet Title:

PLAN AND PROFILE

Sheet Number:

004_CREVE_COEUR_PLAN_PROFILE
Path: P:\1311 - Creve Coeur Dam and Channel\CAD\plans
Plotted on: 10/15/13 @ 6:44 PM by ---



OPTION 4: ENHANCED DAM, CHANNEL, & LAKE

Remove the existing dam and spillway and construct a new earthen dam and a concrete box culvert for a spillway. Line the outfall path and the reconfigured east channel with ledge rock or similar as necessary. Use ledge rock to mask the spillway, to line the east and west banks of the lake, and as aesthetic enhancements. Excavate silt and pond base to create deep thread, and shape banks to create wetland shelves. Include selected native plantings along banks, east channel, and wetland shelves.

- A** New dam with re-routed cart path
- B** Box culvert spillway with ledge rock masking
- C** Outfall lined with ledge rock
- D** East channel re-aligned and lined with ledge rock
- E** Ledge rock wall at pipe entrance
- F** Existing 96" pipe
- G** Ledge rock pond edge and outcropping
- H** Remove silt to create deep (15') channel
- I** Wetland shelves with selected plantings

ESTIMATED COST: \$440,000

1.1.e



CITY OF CREVE COEUR
1949



INTUITIVE LOGIC
ILLINOIS Engineering Incorporated
MO Certificate of Authority
2000152987
16253 Swingley Ridge Rd.
Suite 100
Chesterfield, MO 63017
Phone (636) 777-3000
Fax (314) 432-5812

Creve Coeur Dam and Channel
Creve Coeur, St Louis County, Missouri

Professional Engineer Seal
Mark Edward Meyer
2000150043

Expiration Date: Dec. 31, 2014

Rev	Date	Description
1	10/15/13	Initial Design
2	10/15/13	Revised Design
3	10/15/13	Final Design

Project No. 1311
Designed: TPD
Drawn: JDF
Checked: TPD
Approved: MEM
Sheet Title:
PLAN AND PROFILE
Sheet Number:

Attachment: 2013-10-24 - Dam and Detention Area Rehabilitation Project - Concept Recommendation Memo to Council (1063 : Golf Course Dam

Packet Pg. 92



MEETING MINUTES

JOINT-COMMITTEE MEETING PARKS AND RECREATION COMMITTEE STORMWATER COMMITTEE

WEDNESDAY, SEPTEMBER 25, 2013 AT 5:30 P.M.

PRO SHOP MEETING ROOM
DIELMANN RECREATION COMPLEX
11400 OLDE CABIN ROAD, CREVE COEUR, MISSOURI 63141

PARKS AND RECREATION COMMITTEE MEMBERS & STAFF

KEVIN REJENT, COMMITTEE CHAIR

COUNCIL LIAISON: JEANNE RHOADES

DAVID MCCOY, MEMBER

TED RUZICKA, MEMBER

DAN SIMMS, MEMBER

KIRSTEN BARNES, DIRECTOR OF PARKS AND
RECREATION

BRENT SMITH, MEMBER

JOAN STRADAL, MEMBER

CYNTHIA WESSEL, MEMBER

STORMWATER COMMITTEE MEMBERS & STAFF

STEVE BRODY, P.E., COMMITTEE CHAIR

COUNCIL LIAISON: DR. BOB HOFFMAN

MARTIN JAFFE, COMMITTEE VICE CHAIR

JUDY CAMPBELL, MEMBER

TOM D'ALFONSO, MEMBER

JIM HEINES, DIRECTOR OF PUBLIC WORKS

RICHARD KOCH, P.E., MEMBER

MATT WOHLBERG, P.E., CITY ENGINEER

GEORGE ORTON, MEMBER

I. CALL MEETING TO ORDER AND ROLL CALL

City Engineer Matt Wohlberg called the meeting to order at approximately 5:30.

Parks and Recreation Committee members present: Kevin Rejent
Ted Ruzicka
Dan Simms
Joan Stradal

With four of the six members of the Parks and Recreation Committee in attendance, a quorum was present.

**JOINT COMMITTEE MEETING MINUTES
PARKS AND RECREATION COMMITTEE AND STORMWATER COMMITTEE
WEDNESDAY, SEPTEMBER 25, 2013**

Stormwater Committee members present: Steve Brody, P.E.
Martin Jaffe
Judy Campbell
Tom D'Alfonso
Richard Koch, P.E.
George Orton

With all seven Stormwater Committee members in attendance, a quorum was present.

Stormwater Committee Council Liaison Dr. Bob Hoffman was present.

Guests present: Mark Meyer, P.E., Intuition & Logic

Staff members present: Kirsten Barnes
Jim Heines
Matt Wohlberg

II. DAM, LAKE, AND CHANNEL REHABILITATION PROJECT

Mr. Wohlberg introduced a revised Alternatives Analysis Summary Memorandum, by Mark Meyer of Intuition & Logic and dated September 25, 2013. Mr. Wohlberg stated that the memorandum had been revised to include a more in-depth review of the goals for each design element and the cost of each element. The memorandum was also revised to clarify the potential location for each of the design elements.

Mark Meyer discussed several of the design elements with the committees. Much of the discussion focused on the cost and practicality of each item. The committees agreed that some of the elements were not worth the cost (example: the waterfall at the fifth green), that others could be projects for the golf course (example: retaining wall at fourth hole tee box), and that others should be considered future projects outside of the current needs of the dam (example: siltation of the northern-most lakes).

The discussion concluded with an agreement among all that the dam and channel repair/replacement should include work on the southern lake. In particular, the following design elements were recommended by the committees as target concepts for the design:

Dam and channel repair/replacement:

- Remove the existing dam, channel, and portions of the east channel
- Install a new earthen dam with a boulder outfall for the pond
- Reconfigure the channel to increase its capacity and to incorporate a boulder edge
- Replace the cart path over the dam

Southern lake improvements:

- Remove accumulated silt in the lake and deepen the center to 10'-15' depth
- Install wetland shelves, buffer vegetation, and boulder edging along the banks

The committee members voted and gave unanimous support to the recommendation above.

III. ADJOURNMENT

The meeting adjourned at approximately 7:00 pm

Kevin J. Rejent
11540 Sandhurst Dr.
Creve Coeur, MO 63141

September 27, 2013

Creve Coeur City Council
The Honorable Barry Glantz, Chair
300 North New Ballas Road
Creve Coeur, MO 63141

**Re: Joint Stormwater Committee and Parks and Recreation Committee Golf Course
Dam Repair Meetings**

Dear Esteemed Public Servants,

On September 11, 2013, and September 25, 2013, members of the Stormwater and Parks and Recreation Committees met jointly to address the challenges posed by the failure to the dam on the south end of the golf course. With a quorum of both committees present, we unanimously voted to recommend the following repairs and preventative measures:

- **Dam and Channel Repair**
 - Remove existing concrete spillway
 - Remove existing concrete channel
 - Remove bridge over lower channel
 - Remove bridge over east channel
 - Rebuild dam embankments
 - Install natural boulders pond outfall
 - Install boulder and rock in the lower channel
 - Install flood benching
 - Replace cart path on dam
- **Lower Pond Preventative Measures**
 - Install a bubbler system (solar power with electric backup)
 - Deepen the pond center
 - Install wetland shelves
 - Filter and buffer vegetation at the pond's edge
 - Boulder the pond edge
 - Boulder the edge of the drop area at the #5 green.

While we believe future work will be required to ensure the viability of the upper pond as an effective water retention tool, we agreed that it should be considered as a separate project in the

future so as not to distract from the immediately required repair work on the lower pond, channel, and dam.

While I am certain the City staff involved in the process can provide more and better information than I regarding the necessary work, I am certainly happy to provide whatever information I can should you request it.

Sincerely,



Kevin J. Rejent
Chair – Parks and Recreation Committee



**CITY OF CREVE COEUR - MINUTES
PLANNING AND ZONING COMMISSION MEETING
MONDAY, OCTOBER 21, 2013
7:00 P.M.**

A public hearing and regular meeting of the Planning and Zoning Commission of the City of Creve Coeur, Missouri was held on Monday, October 21, 2013, at the Creve Coeur Government Center, 300 North New Ballas Road. Chair Tim Madden called the meeting to order at 7:00 p.m.

MEMBERS PRESENT: *Mr. Tim Madden, Chair*
 Dr. Michael Barton
 Mr. James Faron
 Mr. Charles Pullium
 Mr. Gene Rovak

OTHERS PRESENT: *Mr. Carl Lumley, City Attorney*
 Mr. Paul Langdon, Director of Community Development
 Ms. Whitney Kelly, AICP, City Planner
 Ms. Julie Lowery, Recording Secretary

2. UNFINISHED BUSINESS

A. Request for Chapter 89 recommendation for improvement concepts related to the Dam, Detention Pond, and Channel Rehabilitation Project at the Creve Coeur Golf Course.

Applicant/Agent: Matt Wohlberg, City Engineer
 Kirsten Barnes, Director of Parks and Recreation

Mr. Wohlberg, City Engineer, said he revised the recommendation from the last meeting, stating the revisions were to clarify the intent by discussing a concept level approach, trying to separate the present and future concerns. Mr. Wohlberg said while at the concept level the details are not fully known, the really broad picture is that the dam needs to be fixed, but the requirements are not fully understood yet. Mr. Wohlberg showed some pictures and explained some options. The options include a basic dam and channel repair, an enhanced dam and channel repair, basic dam, channel, and lake improvements, or enhanced dam, channel, and lake improvements. Mr. Wohlberg has concerns with separating the project out because of duplicating efforts of restoration to certain areas.

Mr. Rovak said he is not in favor of duplicating efforts, but as this comes together he would like to see the master plan. Mr. Faron agreed.

Dr. Barton said in order to keep this moving the question to ask is has the city satisfied the objective to have a plan overall and a methodical approach, which they have. Dr. Barton stated in his opinion from a Planning and Zoning perspective he thinks it should be passed.

Mr. Carl Lumley, City Attorney, clarified the options given are alternates, so you do not do all four; you pick one of the four.

Mr. Robert Kent, 13084 Ferntrails Lane, showed a breakdown of his own cost assessment of the project and also spoke about a Weir pipe drainage system. Please see Mr. Kent's attached notes as reference.

Mr. Wohlberg replied to Mr. Kent's comments and stated that various repair methods are still "on the table", including Mr. Kent's proposal. The options presented are just a concept plan to illustrate the scope of the work needed to address what issues they know need to be resolved.

Mr. Faron asked about the Business District help in funding. Mr. Lumley said if any neighboring businesses were to help it would be on a volunteer basis only. Mr. Lumley explained the City could look at a tax solution, but anything neighborhood related or site specific would be voluntary. Mr. Lumley said the City could look at a tax to give to the voters for approval and could be tailored to only apply to commercial properties, but it would have to go to voter approval.

Dr. Barton motioned to recommend the approval of the proposed improvements to the dam, detention pond, and lower channel at the Creve Coeur Golf Course, as recommended by the City's Park and Recreation Committee, Stormwater Committee, and staff. Mr. Rovak seconded the motion with the resultant vote as follows:

Mr. Pullium – nay
Mr. Rovak – aye

Mr. Faron – aye
Chair - aye

Dr. Barton – aye

3. **ADJORNMENT**

There being no further business to come before the Planning and Zoning Commission, upon motion being made and duly seconded, the meeting was adjourned at 10:35 p.m.

Timothy Madden, Chair

Julie Lowery, Recording Secretary

DAM, DETENTION POND, & CHANNEL

- ☐ HAS THE CITY CONTACTED USD FOR A STORMWATER SUBDISTRICT?
- ☐ WHO OWNS THE COMMERCIAL DISTRICT?
PRINCIPAL PROPERTY OWNERS?
- ☐ HAS STAFF QUALIFIED ENGINEERING OPINION THAT SIGNIFICANT ADDITIONAL DAMAGE WILL OCCUR IF DAM IS NOT REPAIRED IMMEDIATE?
- ☐ WHY ~~IS~~ NOT THE WHOLE SCOPE OF THE PROJECT BEING ADDRESSED TO UNDERSTAND TOTAL COST OF THE PROJECT EVEN IF IT WILL BE DONE IN STAGES — WHAT IS THE TOTAL COST? IS IT \$800,000, \$900,000 OR \$1,000,000?
- ☐ GOLF COURSE IS $\pm$ 25 ACRES OF LANDSCAPE WHY IS 10,000 SQ FT MORE A "BIG DEAL"?
- ☐ WEIR (DUCK) AND UNDER DAM DRAIN IS COMMON OVERFLOW TECHNOLOGY.
- ☐ THE SILTATION SOLUTION SHOULD BE WORKED FROM NORTH TO SOUTH RATHER THAN VICE VERSA — WHAT IF FUNDS BECOME TIGHT?
- ☐ IF A SUBDISTRICT WERE ESTABLISHED, THE ENTIRE RESTORATION PROJECT COULD BE COMPLETED AT ONE TIME AND BONDS ISSUED OR SPECIAL TAXES ESTABLISHED.
- ☐ IN ANY EVENT THE BEAUTIFICATION ENHANCEMENT STANDS ON ITS OWN JUSTIFICATION.
- ☐ ANY AUTHORIZATION SHOULD BE CONDITIONAL
 - URGENCY FROM SOILS ENGINEER
 - SUBJECT TO FINANCING BY SUBDISTRICT
 - TOTAL PROJECT COST ESTIMATE
 - SCHEDULE OF RESTORATION APPLICATION

WEIR PIPE DRAINAGE

- ☐ REMOVE EXISTING OVERFLOW SYSTEM \$ 13,000
- CONCRETE SPILLWAY
 - CONCRETE CHANNEL
 - BRIDGE OVER LOWER CHANNEL
- ☐ INSTALL 100' OF 4' PRECAST "O" RING PIPE AND WEIR
- PIPE DELIVERED \$ 6203
 - CONTRACT LABOR/PROFIT 12406
 - 18609
- CALL IT \$ 20,000
- ☐ REBUILD DAM EMBANKMENT \$ 40,000
(800 YARDS @ \$ 50.00/YD)
- ☐ EXTEND 4' PRECAST PIPE EAST
- 50' PIPE @ \$ 62.03 \$ 3101.05
 - LABOR AND PROFIT 6203.10
 - \$ 9304.25
- CALL IT \$ 10,000
- ☐ COVER DISCHARGE PIPE AND EAST INLET PIPE \$ 5,000
(100 YARDS @ \$ 50.00/YD)
- ☐ LANDSCAPE SOUTH SIDE OF DAM \$ 5000
- ☐ CART PATH ON TOP OF DAM AND LOWER CHANNEL \$ 10,000
(10' WIDE UP TO 200' @ \$ 50.00/FT)
- TOTAL COST \$ 103,000

DAM REPAIR, DRAIN, LANDSCAPE
AND CART PATHS.
(NO NEW BRIDGES REQUIRED)



city of CREVE COEUR

300 North New Ballas Road • Creve Coeur, Missouri 63141
 (314) 872-2500/872-2501 • Fax (314) 872-2505 • Relay MO 1-800-735-2966
www.creve-coeur.org

October 24, 2013

Honorable Mayor Barry Glantz & City Council
 City of Creve Coeur
 300 N. New Ballas Road
 Creve Coeur, MO 63141

Re: Concept plan for dam, detention pond, and channel rehabilitation project
 Creve Coeur Golf Course

Honorable Mayor Glantz & Members of the City Council:

The Planning and Zoning Commission, at its meeting of October 21, 2013, reviewed a request for a concept plan to make improvements to the dam, detention pond, and lower channel at the City of Creve Coeur's Golf Course.

By a 4-1 vote, the Planning Commission recommends the City pursue the full scope of repairs and enhancements to the dam, detention pond, and lower channel at the Creve Coeur Golf Course.

Sincerely,

CITY OF CREVE COEUR

Timothy Madden, Chairman
 Planning & Zoning Commission

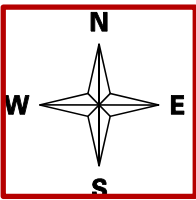
TM:jl

Cc: M.C. Perkins, City Administrator
 J. Heines, Director of Public Works
 M. Wohlberg, City Engineer
 K. Barnes, Director of Parks and Recreation
 G. Eidman, Chief of Police
 S. Unser, Chief Building Official



LEGEND	
IMPROVE	SYSTEM IMPROVEMENT OR REPAIR
MAINTAIN	SYSTEM MAINTENANCE
BEAUTIFY	SYSTEM ENHANCEMENT
BMP AREA	AREA LIKELY SUITED FOR A STORMWATER BEST MANAGEMENT PRACTICE (BMP)
	STORMWATER DRAINAGE PATH
	LAKE

STORMWATER SYSTEM IMPROVEMENT MASTER PLAN
CREVE COEUR GOLF COURSE



Location	Description	Type	Nature
South Pond	Dam Replacement	Improvement	Stormwater
South Pond	Silt Removal	Improvement/Maintenance	Stormwater
South Pond	Dam/Pond Enhancements	Enhancement	Golf Course

North Ponds	Silt Removal	Improvement/Maintenance	Stormwater
North Ponds	Convert North Lake to Forebay	Improvement	Stormwater
North Ponds	Replace Gabion Rock Pond Edge with Boulders	Enhancement	Golf Course
North Ponds	Hydrodynamic Separator(s)	Improvement	Stormwater
North Ponds	Repair North Lake Boulder Wall	Improvement	Golf Course
North Ponds	Replace Bridge	Improvement	Golf Course

Golf Course	Stormwater Mitigation (BMP)	Improvement	Stormwater
-------------	-----------------------------	-------------	------------

CONSTRUCTION				
Construction Year	Quantity	Unit	Unit Cost	Construction Cost
2015	1	LS	\$ 250,000	\$ 250,000
2015	900	CY	\$ 100	\$ 90,000
2015	1	LS	\$ 125,000	\$ 125,000
Construction Subtotal:				\$ 465,000

2019	3000	CY	\$ 100	\$ 300,000
2019	1	LS	\$ 100,000	\$ 100,000
2019	1000	SF	\$ 75	\$ 75,000
2019	1	EA	\$ 100,000	\$ 100,000
2019	2000	SF	\$ 40	\$ 80,000
2019	1	LS	\$ 30,000	\$ 30,000
Construction Subtotal:				\$ 685,000

2019	1	LS	\$ 100,000	\$ 100,000
Construction Subtotal:				\$ 100,000

Location	Description	Type	Nature
South Pond	Dam Replacement	Improvement	Stormwater
South Pond	Silt Removal	Improvement/Maintenance	Stormwater
South Pond	Dam/Pond Enhancements	Enhancement	Golf Course

North Ponds	Silt Removal	Improvement/Maintenance	Stormwater
North Ponds	Convert North Lake to Forebay	Improvement	Stormwater
North Ponds	Replace Gabion Rock Pond Edge with Boulders	Enhancement	Golf Course
North Ponds	Hydrodynamic Separator(s)	Improvement	Stormwater
North Ponds	Repair North Lake Boulder Wall	Improvement	Golf Course
North Ponds	Replace Bridge	Improvement	Golf Course

Golf Course	Stormwater Mitigation (BMP)	Improvement	Stormwater
-------------	-----------------------------	-------------	------------

MAINTENANCE (2015-2035)		
Annual Maint. Cost	Work Interval (Years)	Total Maint. Cost
\$ 5,000	5	\$ 20,000
\$ 150,000	20	\$ 150,000
\$ 2,500	1	\$ 50,000
Maintenance Subtotal:		\$ 220,000

\$ 100,000	20	\$ -
\$ 500	1	\$ 8,000
\$ 500	1	\$ 8,000
\$ 50,000	1	\$ 800,000
\$ 500	1	\$ 8,000
\$ 100	1	\$ 1,600
Maintenance Subtotal:		\$ 825,600

\$ 3,000	1	\$ 48,000
Maintenance Subtotal:		\$ 48,000

Total Anticipated Costs (2015-2035)	
\$	270,000
\$	240,000
\$	175,000
Total:	\$ 685,000

\$	300,000
\$	108,000
\$	83,000
\$	900,000
\$	88,000
\$	31,600
Total:	\$ 1,510,600

\$	148,000
Total:	\$ 148,000