



**US Army Corps
of Engineers®**
St. Paul District

Appendix O: Quantities

Fargo Moorhead Metropolitan Area
Flood Risk Management Project
**Reach 5, Volumes 1 and 3: Stations 521+00
to 566+00 and 596+00 to 656+00**

Engineering and Design Phase

P2# 370365

Doc Version: Final Technical Signoff

30 September 2014

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Appendix O: Quantities

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Attachments

Attachment O-1 - Civil Quantities

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Appendix O: Quantities

O.1 GENERAL

The quantities received from PDT members have been attached to this appendix.

O.2 CIVIL QUANTITIES

The civil quantities include quantities for channel excavation, stripping, levee, EMB, shaping of EMB undulations, geotextile types 1 and 2, riprap, EMB maintenance roads, access roads, culverts, ditch excavation, topsoil, and seeding, and miscellaneous associated work broken down by volume. See attachments to this appendix for detailed list of quantities.

O.3 ORGANIZATION OF QUANTITIES

Note that the first 2 sheets of quantities attached to this appendix are those associated with the diversion channel, EMBs and ditches. The 3rd and 4th sheets describe the DTMs used to compute the volumes. The 5th sheet breaks down the channel excavation by soil type. The 6th sheet summarizes the quantities associated with the EMB access roads. In some cases, the totals from each of these sets of quantities must be added to arrive at the total quantities in the bid schedules. The 7th sheet describes the quantities for the access gates.

Volume1

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT	Ratio check (length 4500/6000 =75%
0001	DEMOLITION	1	LS			
0002	STRIPPING					
0002AA	FIRST	9,123	CY			
0002AB	OVER		CY			
0003	CLEARING AND GRUBBING		LS			
0004	TEMPORARY EROSION PROTECTION		LS			
0005	TRAFFIC CONTROL		LS			
0006	CARE OF WATER		LS			
0007	DIVERSION CHANNEL EXCAVATION					
7AA	FIRST	1,537,882	CY			75% ok
7AB	OVER		CY			
0008	SHAPING OF RIGHT BANK EMB UNDULATIONS	146,079	SY			65% right emb narrower at farmstead
0009	GEOTEXTILE TYPE 1		SY			
0010	GEOTEXTILE TYPE 2	21,000	SY			75% ok
0011	B1 BEDDING					
11AA	FIRST		TN			
11AB	OVER		TN			
0012	R20 RIPRAP					
12AA	FIRST		TN			
12AB	OVER		TN			
0013	TOPSOIL					
13AA	FIRST	161,315	CY			67% right emb narrower at farmstead
13AB	OVER		CY			
0014	SEEDING - DRY ZONE SEED MIX	88	AC			68%
0015	SEEDING - WET ZONE SEED MIX	82	AC			79%
0016	RIGHT BANK DRAINAGE DITCHING					
16AA	FIRST	35,418	CY			132% ditch grade lower to tie into lower rush
16AB	OVER		CY			
0017	LEFT BANK DRAINAGE DITCHING					
17AA	FIRST	19,214	CY			41% ditch grade higher
17AB	OVER		CY			
0018	EMB MAINTENANCE ROAD CORRIDOR	3,491	CY			75% ok
0019	18 INCH CORRUGATED STEEL PIPE		LF			
0020	18 INCH CORRUGATED STEEL PIPE FLARED END SECTION		EA			
0021	30 INCH CORRUGATED STEEL PIPE		LF			
0022	30 INCH CORRUGATED STEEL PIPE FLARED END SECTION		EA			
0023	42 INCH CORRUGATED STEEL PIPE		LF			
0024	42 INCH CORRUGATED STEEL PIPE FLARED END SECTION		EA			
0025	EMB ACCESS ROAD - LEFT BANK		LF			
0026	EMB ACCESS ROAD - RIGHT BANK		LF			
0027	DRAIN TILE REMOVAL		LF			
0028	PERFORMANCE AND PAYMENT BONDS		LS			

Volume3

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0001	DEMOLITION		1 LS		
0002	STRIPPING				
0002AA	FIRST	20,055	CY		
0002AB	OVER		CY		
0003	CLEARING AND GRUBBING		LS		
0004	TEMPORARY EROSION PROTECTION		LS		
0005	TRAFFIC CONTROL		LS		
0006	CARE OF WATER		LS		
0007	DIVERSION CHANNEL EXCAVATION				
7AA	FIRST	2,039,443	CY		
7AB	OVER		CY		
0008	SHAPING OF RIGHT BANK EMB UNDULATIONS	223,746	SY		
0009	GEOTEXTILE TYPE 1		SY		
0010	GEOTEXTILE TYPE 2	28,000	SY		
0011	B1 BEDDING				
11AA	FIRST		TN		
11AB	OVER		TN		
0012	R20 RIPRAP				
12AA	FIRST		TN		
12AB	OVER		TN		
0013	TOPSOIL				
13AA	FIRST	239,534	CY		
13AB	OVER		CY		
0014	SEEDING - DRY ZONE SEED MIX	130	AC		
0015	SEEDING - WET ZONE SEED MIX	103	AC		
0016	RIGHT BANK DRAINAGE DITCHING				
16AA	FIRST	26,860	CY		
16AB	OVER		CY		
0017	LEFT BANK DRAINAGE DITCHING				
17AA	FIRST	46,861	CY		
17AB	OVER		CY		
0018	EMB MAINTENANCE ROAD CORRIDOR	4,654	CY		
0019	18 INCH CORRUGATED STEEL PIPE		LF		
0020	18 INCH CORRUGATED STEEL PIPE FLARED END SECTION		EA		
0021	30 INCH CORRUGATED STEEL PIPE		LF		
0022	30 INCH CORRUGATED STEEL PIPE FLARED END SECTION		EA		
0023	42 INCH CORRUGATED STEEL PIPE		LF		
0024	42 INCH CORRUGATED STEEL PIPE FLARED END SECTION		EA		
0025	EMB ACCESS ROAD - LEFT BANK		LF		
0026	EMB ACCESS ROAD - RIGHT BANK		LF		
0027	DRAIN TILE REMOVAL		LF		
0028	PERFORMANCE AND PAYMENT BONDS		LS		

* the low flow channel breaklines were intentionally not placed into the finished grade dtm. Adding the low flow lines changes the triangulation pattern in the 300' channel bottom because the meandering low flow breaklines have many more vertices than the bottom of channel breaklines.

Reach 5

Volume 1

Description	DTM	Remarks:
Top surface	FMMDR5_V1_CHANNEL_WITH_UNDULATIONS	Surface for calculating topsoil quantities. Includes undulations and ditches. Does not include low flow channel. "finished grade" top surface dtm.
Bottom of topsoil/subgrade	FMMDR5_V1_CHANNEL_WITH_UNDULATIONS_TOPSOIL	Surface for calculating topsoil and random fill quantities. Includes undulations and ditches. Does not include low flow channel*. Deduct the low flow channel area from the triangle volume calculation and add back the topsoil qty calculated separately using the meander alignment.. Remember to deduct from the topsoil qty to account for the aggregate that is below the top of subgrade surface.
Existing ground	FMMFRM_05	"existing grade" dtm, combination of lidar and ground survey.
Low flow topsoil	LF Topsoil	Used for LF excavation volume and topsoil.
Low flow	Volume 1 LF Test	Used for LF topsoil.
Embedded levee	V1 Levee	If separate bid item subtract from random fill quantity
Stripping for embedded levee	V1 Levee Stripping	Add to cut quantity
IRD		
Main EMBs and Channel	FMR5 Corridors.ird	
Low flow	Volume 1 corridor full	Uses parametric constraints for transitions.
	Volume 1 LF	
ALG		
Geometry Project	FMMDR5 Alignments	Contains alignments
ITL		
Template Library	FMMDR5_2012.itl	Templates for roadway designer

**Volume 3
Description**

DTM

Top surface

V3 Channel Full

Bottom of topsoil/subgrade

FMMDR5_TOPSOIL

Existing ground

FMMFRM_06

Left Local Drainage Ditch

FMMDR5V3_LEFT_DITCH

Right Local Drainage Ditch

FMMDR5V3_RIGHT_DITCH

Left Local Drainage Ditch Topsoil

FMMDR5V3_LEFT_DITCH_TOPSOIL

Right Local Drainage Ditch Topsoil

FMMDR5V3_RIGHT_DITCH_TOPSOIL

Low Flow channel

V3 LF Channel

Low Flow channel topsoil

V3 LF Topsoil

Embedded levee

V3 Levee

Stripping for embedded levee

V3 Levee Stripping

IRD

Roadway Designer file

FMR5 Corridors.ird

Main EMBs and Channel corridor

Volume 3 corridor full

Low flow corridor

Volume 3 LF

Volume 3 Right Di

ALG

Geometry Project

FMMDR5 Alignments

ITL

Template Library

FMMDR5_2012.itl

Remarks:

Surface for calculating topsoil quantities. Includes undulations. Does not include low flow channel or ditches. "finished grade" top surface dtm.

Surface for calculating topsoil and random fill quantities. Includes undulations. Does not include low flow channel or ditches. Deduct the low flow channel area from the triangle volume calculation and add back the topsoil qty calculated separately using the meander alignment.. Remember to deduct from the topsoil qty to account for the aggregate that is below the top of subgrade surface.

"existing grade" dtm, combination of lidar and ground survey.

used for ditch topsoil quantities

used for ditch topsoil quantities

Used for ditch cut quantities

Used for ditch cut quantities

Low flow topsoil

Low Flow Channel excavation

If separate bid item subtract from random fill quantity

Add to cut quantity

Uses parametric constraints for transitions.

Contains alignments

Templates for roadway designer

FMMDR5_SOIL EXCAVATION QUANTITIES
10/01/2014 BY CRM

VOLUME 1-TYPE 4

Original Surface	Design Surface	
FMMDR5_V1_TYP4_Bottom_Excavation	FMMDR5_V1_TYP4_Top_Excavation	<u>129856 CU.YD.</u>

VOLUME 3-TYPE 4

Original Surface	Design Surface	
FMMDR5_V3_TYP4_Bottom_Excavation	FMMDR5_V3_TYP4_Top_Excavation	<u>206166 CU.YD.</u>

TOTAL TYPE 4	336022 CU.YD.
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VOLUME 1-TYPE 3

Original Surface	Design Surface	
FMMDR5_V1_TYPE3_Bottom_Excavation	FMMDR5_V1_TYP3_Top_Excavation	<u>566105 CU.YD.</u>

VOLUME 3-TYPE 3

Original Surface	Design Surface	
FMMDR5_V3_TYP3_Bottom_Excavation	FMMDR5_V3_TYP3_Top_Excavation	<u>638805 CU.YD.</u>

TOTAL TYPE 3	1204910 CU.YD.
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VOLUME 1-TYPE 2

Original Surface	Design Surface	
FMMDR5_V1_TYPE2_Bottom_Excavation	FMMDR5_V1_TYPE2_Top_Excavation	<u>261243 CU.YD.</u>

VOLUME 3-TYPE 2

Original Surface	Design Surface	
FMMDR5_V3_TYP2_Bottom_Excavation	FMMDR5_V3_TYP2_Top_Excavation	<u>629268 CU.YD.</u>

TOTAL TYPE 2	890512 CU.YD.
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VOLUME 1-TYPE 1

Original Surface	Design Surface	
FMMDR5_V1_TYP1_Bottom_Excavation	FMMDR5_V1_TYP1_Top_Excavation	<u>356338 CU.YD.</u>

VOLUME 3-TYPE 1

Original Surface	Design Surface	
FMMDR5_V3_TYP1_Bottom_Excavation	FMMDR5_V3_TYP1_Top_Excavation	<u>356157 CU.YD.</u>

TOTAL TYPE 1	712495 CU.YD.
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VOLUME 1-TYPE TOPSOIL

Original Surface	Design Surface	
FMMDR5_V1_TPSSL_Bottom_Excavation	FMMDR5_V1_TPSSL_Top_Surface	<u>170838 CU.YD.</u>

VOLUME 3-TYPE TOPSOIL

Original Surface	Design Surface	
FMMDR5_V3_TPSSL_Bottom_Excavation	FMMDR5_V3_TPSSL_Top_Surface	<u>200582 CU.YD.</u>

TOTAL TYPE TOPSOIL	371420 CU.YD.
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Total Excavation Volume 1 & 3	3515358 CU.YD.
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Total Excavation Volume 1	1484380 CU.YD.
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Total Excavation Volume 3	2030978 CU.YD.
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Total Excavation Volume 1 & 3	3515358 CU.YD.
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<u>VOLUME 1-30TH ST SE EMB ACCESS ROAD-LEFT BANK (LA) STA. 0+00 - STA. 2+97.98</u>					298 LN.FT.
0 CULVERT, NOT REQUIRED HIGH POINT/GRADE BREAK					0 LN.FT.
RANDOM FILL					771 CU.YD.
IMPERVIOUS FILL, 36" DEPTH, 20' V	3.00	5,960 SQ.FT.	20,829 CU.FT.		662 CU.YD.
GEOTEXTILE, TYPE 2		6,357 SQ.FT.	17,879 CU.FT.		706 SQ.YD.
8" AGGREGATE BASE, 20FT WIDE	0.67	5,960 SQ.FT.	3,973 CU.FT.		147 CU.YD.
8" TOPSOIL	0.67	2,980 SQ.FT.	1,987 CU.FT.		74 CU.YD.
6" TOPSOIL	0.50	7,024 SQ.FT.	3,512 CU.FT.		130 CU.YD.

<u>VOLUME 1-76TH AVE N EMB ACCESS ROAD-RIGHT BANK (RA) STA. 0+00 - STA. 4+82.83</u>					483 LN.FT.
0 CULVERT, NOT REQUIRED HIGH POINT/GRADE BREAK					0 LN.FT.
RANDOM FILL					79 CU.YD.
IMPERVIOUS FILL, 36" DEPTH, 20' V	3.00	9,657 SQ.FT.	2,129 CU.FT.		1073 CU.YD.
GEOTEXTILE, TYPE 2		10,300 SQ.FT.	28,970 CU.FT.		1144 SQ.YD.
8" AGGREGATE BASE, 20FT WIDE	0.67	9,657 SQ.FT.	6,438 CU.FT.		238 CU.YD.
8" TOPSOIL	0.67	4,828 SQ.FT.	3,219 CU.FT.		119 CU.YD.
6" TOPSOIL	0.50	5,425 SQ.FT.	2,713 CU.FT.		100 CU.YD.

<u>VOLUME 3-32ND ST SE EMB ACCESS ROAD-LEFT BANK (LB) STA. 0+00 - STA. 3+36.44</u>					336 LN.FT.
1 CULVERT, 64"x43" CSPA W/ 2 FES					91 LN.FT.
RANDOM FILL					389 CU.YD.
IMPERVIOUS FILL, 36" DEPTH, 20' V	3.00	6,729 SQ.FT.	10,508 CU.FT.		748 CU.YD.
GEOTEXTILE, TYPE 2		7,177 SQ.FT.	20,186 CU.FT.		797 SQ.YD.
8" AGGREGATE BASE, 20FT WIDE	0.67	6,729 SQ.FT.	4,486 CU.FT.		166 CU.YD.
8" TOPSOIL	0.67	3,364 SQ.FT.	2,243 CU.FT.		83 CU.YD.
6" TOPSOIL	0.50	9,883 SQ.FT.	4,941 CU.FT.		183 CU.YD.

<u>VOLUME 1 FIELD DRAINS</u>					
3 18" CSP INTERCEPT CULVERT		35 LN.FT.			105 LN.FT.
3 FLAPGATE					3 EA.
3 FLARED END SECTION					3 EA.
3 R20 RIPRAP, 18" THICK	1.5	720 SQ.FT.	1,080 CU.FT.		120 CU.YD.
3 GEOTEXTILE, TYPE 1		720 SQ.FT.			240 SQ.YD.
4 R20 RIPRAP, 18" THICK	1.5	720 SQ.FT.	1,080 CU.FT.		160 CU.YD.
4 GEOTEXTILE, TYPE 1		720 SQ.FT.			320 SQ.YD.

<u>VOLUME 3 FIELD DRAINS</u>					
0 18" CSP INTERCEPT CULVERT		25 LN.FT.			0 LN.FT.
0 FLAPGATE					0 EA.
0 FLARED END SECTION					0 EA.
0 R20 RIPRAP, 18" THICK	1.5	720 SQ.FT.	1,080 CU.FT.		0 CU.YD.
0 GEOTEXTILE, TYPE 1		720 SQ.FT.			0 SQ.YD.
13 R20 RIPRAP, 18" THICK	1.5	720 SQ.FT.	1,080 CU.FT.		520 CU.YD.
13 GEOTEXTILE, TYPE 1		720 SQ.FT.			1040 SQ.YD.

STEEL GATE MEMBER PROPERTIES	
	Weight
8" Dia Pipe	28.55 lbs/LF
4" Dia Pipe	10.79 lbs/LF
3/4" Dia Pipe	1.13 lbs/LF
3/4" Anchor bolt	
3/8" Plate	183.75 lbs/SF

Mk	Description	Weight
A	Top Rail	15 LF 161.85 lbs
B	Diagonal Rail	13.6 LF 146.744 lbs
C	Vertical Pipe	2.667 LF 28.7769 lbs
D	Post - Hinge	8.833333 LF 95.3117 lbs
E	Post - Closing	8.833333 LF 95.3117 lbs
F	Hinge Pipes - Total	1.5 LF 1.695 lbs
G	Hinge Plates	0.111111 SF 20.4167 lbs
H	Bracket Plate	0.097222 SF 17.8646 lbs
I	Hold Back Post	8.833333 LF 95.3117 lbs
J	Bracket Plate	0.097222 SF 17.8646 lbs
K	Guard Post - L	5.5 LF 157.025 lbs
L	Guard Post - R	5.5 LF 157.025 lbs
TOTAL WEIGHT		995.197 lbs

Diagonal Rail Length	
Top chord	13.33333 LF
Side Chord	2.666667 LF
Diagonal Length	13.59739 LF

1.55

