

# HORIZONTAL & VERTICAL ALIGNMENT REPORTS

FWS CMR 61520(1)  
Charles M Russell Refuge Repairs  
03/07/2022

## Horizontal Alignment Review Report

Report Created: Monday, March 7, 2022  
Time: 4:16:33 PM

**Project:** Default

**Description:**

**File Name:** F:\7125 CMR - Wildlife Refuge Repairs\dgn\Design DGN\100%Design\MT FWS  
CMR 61520(1) 7 Mile\_cor.dgn

**Last Revised:** 3/7/2022 16:15:55

**Note:** All units in this report are in feet unless specified otherwise.

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**Alignment Name:** BL16

**Alignment Description:**

**Alignment Style:** Alignment\Baseline

		<u>Station</u>	<u>Northing</u>	<u>Easting</u>
Element: Linear				
START	( )	7275.000	1220716.001	2264378.602
END	( )	7380.000	1220742.074	2264480.314
Tangential Direction:		N75.622°E		
Tangential Length:		105.000		

# Horizontal Alignment Review Report

Report Created: Monday, March 7, 2022  
Time: 4:19:18 PM

**Project:** Default

**Description:**

**File Name:** F:\7125 CMR - Wildlife Refuge Repairs\dgn\Design DGN\100%Design\MT FWS  
CMR 61520(1) Nichols Creek\_cor.dgn

**Last Revised:** 3/7/2022 16:18:58

**Note:** All units in this report are in feet unless specified otherwise.

**Alignment Name:** BL10

**Alignment Description:**

**Alignment Style:** Alignment\Baseline

		<u>Station</u>	<u>Northing</u>	<u>Easting</u>
Element: Linear				
START	( )	5000.002	1220721.199	2280597.009
PC	( )	5103.146	1220756.472	2280693.934
Tangential Direction:		N70.003°E		
Tangential Length:		103.144		
Element: Circular				
PC	( )	5103.146	1220756.472	2280693.934
HPI	( )	5133.297	1220766.783	2280722.268
CC	( )		1220286.617	2280864.921
PT	( )	5163.375	1220773.614	2280751.634
Radius:		500.000		
Delta:		6.902° Right		
Degree of Curvature (Arc):		11.459°		
Length:		60.229		
Tangent:		30.151		
Chord:		60.193		
Middle Ordinate:		0.907		
External:		0.908		
Back Tangent Direction:		N70.003°E		
Back Radial Direction:		S19.997°E		
Chord Direction:		N73.454°E		
Ahead Radial Direction:		S13.095°E		
Ahead Tangent Direction:		N76.905°E		
Element: Linear				
PT	( )	5163.375	1220773.614	2280751.634
PC	( )	5256.670	1220794.752	2280842.503
Tangential Direction:		N76.905°E		
Tangential Length:		93.295		

## Element: Circular

PC	( )	5256.670	1220794.752	2280842.503
HPI	( )	5304.001	1220805.476	2280888.603
CC	( )		1220064.257	2281012.433
PT	( )	5351.208	1220810.320	2280935.687
Radius:		750.000		
Delta:		7.222° Right		
Degree of Curvature (Arc):		7.639°		
Length:		94.538		
Tangent:		47.332		
Chord:		94.475		
Middle Ordinate:		1.489		
External:		1.492		
Back Tangent Direction:		N76.905°E		
Back Radial Direction:		S13.095°E		
Chord Direction:		N80.516°E		
Ahead Radial Direction:		S5.873°E		
Ahead Tangent Direction:		N84.127°E		

## Element: Linear

PT	( )	5351.208	1220810.320	2280935.687
PC	( )	5570.014	1220832.710	2281153.345
Tangential Direction:		N84.127°E		
Tangential Length:		218.807		

## Element: Circular

PC	( )	5570.014	1220832.710	2281153.345
HPI	( )	5601.292	1220835.910	2281184.458
CC	( )		1220484.547	2281189.159
PT	( )	5632.404	1220833.543	2281215.647
Radius:		350.000		
Delta:		10.213° Right		
Degree of Curvature (Arc):		16.370°		
Length:		62.390		
Tangent:		31.278		
Chord:		62.308		
Middle Ordinate:		1.389		
External:		1.395		
Back Tangent Direction:		N84.127°E		
Back Radial Direction:		S5.873°E		
Chord Direction:		N89.233°E		
Ahead Radial Direction:		S4.340°W		
Ahead Tangent Direction:		S85.660°E		

## Element: Linear

PT	( )	5632.404	1220833.543	2281215.647
END	( )	5669.207	1220830.758	2281252.344

Tangential Direction:	S85.660°E
Tangential Length:	36.803

# Vertical Alignment Review Report

Report Created: Monday, March 7, 2022  
Time: 4:20:04 PM

**Project:** Default

**Description:**

**File Name:** F:\7125 CMR - Wildlife Refuge Repairs\dgn\Design DGN\100%Design\MT FWS  
CMR 61520(1) Nichols Creek\_cor.dgn

**Last Revised:** 3/7/2022 16:19:20

**Note:** All units in this report are in feet unless specified otherwise.

**Horizontal Alignment:** BL10

**Horizontal Description:**

**Horizontal Style:** Alignment\Baseline

**Vertical Alignment:** Unnamed

**Vertical Description:**

**Vertical Style:** Alignment\Baseline

	<b>Station</b>	<b>Elevation</b>
Element: Linear		
START	5090.000	2257.546
VPC	5185.000	2256.810
Tangent Grade:	-0.008	
Tangent Length:	95.000	
Element: Symmetrical Parabola		
VPC	5185.000	2256.810
VPI	5225.000	2256.500
VPT	5265.000	2257.171
VLP	5210.268	2256.712
Length:	80.000	
Entrance Grade:	-0.008	
Exit Grade:	0.017	
$r = 100 * (g2 - g1) / L$ :	3.067	
$K = L / (g2 - g1)$ :	32.606	
Middle Ordinate:	0.245	
Element: Linear		
VPT	5265.000	2257.171
VPC	5330.000	2258.263
Tangent Grade:	0.017	
Tangent Length:	65.000	
Element: Symmetrical Parabola		
VPC	5330.000	2258.263

VPI	5370.000	2258.934
VPT	5410.000	2258.946
Length:	80.000	
Entrance Grade:	0.017	
Exit Grade:	0.000	
$r = 100 * (g2 - g1) / L$ :	-2.062	
$K = L / (g2 - g1)$ :	48.493	
Middle Ordinate:	-0.165	
Element: Linear		
VPT	5410.000	2258.946
END	5460.000	2258.960
Tangent Grade:	0.000	
Tangent Length:	50.000	

# Horizontal Alignment Review Report

Report Created: Monday, March 7, 2022  
Time: 4:07:15 PM

**Project:** Default

**Description:**

**File Name:** F:\7125 CMR - Wildlife Refuge Repairs\dgn\Design DGN\100%Design\MT FWS  
CMR 61520(1) **Rock Creek\_cor.dgn**

**Last Revised:** 3/7/2022 16:07:05

**Note:** All units in this report are in feet unless specified otherwise.

**Alignment Name:** BL6

**Alignment Description:**

**Alignment Style:** Alignment\Baseline

		<u>Station</u>	<u>Northing</u>	<u>Easting</u>
Element: Linear				
START	( )	3000.002	1227304.317	2220915.577
PC	( )	3099.277	1227352.822	2221002.196
Tangential Direction:		N60.752°E		
Tangential Length:		99.275		
Element: Circular				
PC	( )	3099.277	1227352.822	2221002.196
HPI	( )	3171.306	1227388.015	2221065.042
CC	( )		1229097.843	2220025.004
PT	( )	3243.274	1227427.639	2221125.194
Radius:		2000.000		
Delta:		4.125° Left		
Degree of Curvature (Arc):		2.865°		
Length:		143.997		
Tangent:		72.030		
Chord:		143.966		
Middle Ordinate:		1.296		
External:		1.297		
Back Tangent Direction:		N60.752°E		
Back Radial Direction:		S29.248°E		
Chord Direction:		N58.689°E		
Ahead Radial Direction:		S33.374°E		
Ahead Tangent Direction:		N56.626°E		
Element: Linear				
PT	( )	3243.274	1227427.639	2221125.194
PC	( )	3899.425	1227788.584	2221673.148
Tangential Direction:		N56.626°E		
Tangential Length:		656.151		



## Element: Circular

PC	( )	3899.425	1227788.584	2221673.148
HPI	( )	3936.728	1227809.104	2221704.299
CC	( )		1228206.135	2221398.100
PT	( )	3973.892	1227834.019	2221732.061
Radius:		500.000		
Delta:		8.533° Left		
Degree of Curvature (Arc):		11.459°		
Length:		74.467		
Tangent:		37.303		
Chord:		74.398		
Middle Ordinate:		1.386		
External:		1.390		
Back Tangent Direction:		N56.626°E		
Back Radial Direction:		S33.374°E		
Chord Direction:		N52.360°E		
Ahead Radial Direction:		S41.907°E		
Ahead Tangent Direction:		N48.093°E		

## Element: Linear

PT	( )	3973.892	1227834.019	2221732.061
END	( )	4085.800	1227908.765	2221815.346
Tangential Direction:		N48.093°E		
Tangential Length:		111.908		

# Vertical Alignment Review Report

Report Created: Monday, March 7, 2022  
Time: 4:08:09 PM

**Project:** Default

**Description:**

**File Name:** F:\7125 CMR - Wildlife Refuge Repairs\dgn\Design DGN\100%Design\MT FWS  
CMR 61520(1) **Rock Creek\_cor.dgn**

**Last Revised:** 3/7/2022 16:07:05

**Note:** All units in this report are in feet unless specified otherwise.

**Horizontal Alignment:** BL6

**Horizontal Description:**

**Horizontal Style:** Alignment\Baseline

**Vertical Alignment:** Unnamed

**Vertical Description:**

**Vertical Style:** Alignment\Baseline

	<b>Station</b>	<b>Elevation</b>
Element: Linear		
START	3110.000	2289.142
VPC	3115.000	2289.071
Tangent Grade:	-0.014	
Tangent Length:	5.000	
Element: Symmetrical Parabola		
VPC	3115.000	2289.071
VPI	3160.000	2288.425
VPT	3205.000	2285.162
Length:	90.000	
Entrance Grade:	-0.014	
Exit Grade:	-0.073	
$r = 100 * (g2 - g1) / L$ :	-6.461	
$K = L / (g2 - g1)$ :	15.477	
Middle Ordinate:	-0.654	
Element: Linear		
VPT	3205.000	2285.162
VPC	3250.000	2281.900
Tangent Grade:	-0.073	
Tangent Length:	45.000	
Element: Symmetrical Parabola		
VPC	3250.000	2281.900
VPI	3290.000	2279.000

VPT	3330.000	2279.000
Length:	80.000	
Entrance Grade:	-0.073	
Exit Grade:	0.000	
$r = 100 * (g2 - g1) / L$ :	9.063	
$K = L / (g2 - g1)$ :	11.034	
Middle Ordinate:	0.725	
Element: Linear		
VPT	3330.000	2279.000
VPC	3540.000	2279.000
Tangent Grade:	0.000	
Tangent Length:	210.000	
Element: Symmetrical Parabola		
VPC	3540.000	2279.000
VPI	3580.000	2279.000
VPT	3620.000	2281.417
Length:	80.000	
Entrance Grade:	0.000	
Exit Grade:	0.060	
$r = 100 * (g2 - g1) / L$ :	7.552	
$K = L / (g2 - g1)$ :	13.241	
Middle Ordinate:	0.604	
Element: Linear		
VPT	3620.000	2281.417
VPC	3645.000	2282.927
Tangent Grade:	0.060	
Tangent Length:	25.000	
Element: Symmetrical Parabola		
VPC	3645.000	2282.927
VPI	3700.000	2286.250
VPT	3755.000	2286.288
Length:	110.000	
Entrance Grade:	0.060	
Exit Grade:	0.001	
$r = 100 * (g2 - g1) / L$ :	-5.430	
$K = L / (g2 - g1)$ :	18.416	
Middle Ordinate:	-0.821	
Element: Linear		
VPT	3755.000	2286.288
END	3765.000	2286.295
Tangent Grade:	0.001	
Tangent Length:	10.000	

# Horizontal Alignment Review Report

Report Created: Monday, March 7, 2022  
Time: 11:52:31 AM

**Project:** Default

**Description:**

**File Name:** F:\7125 CMR - Wildlife Refuge Repairs\dgn\Design DGN\100%  
Design\MT\_FWS\_CMR\_61520(1)\_Sand\_Creek\_Bridge\_cor.dgn

**Last Revised:** 3/7/2022 11:36:15

**Note:** All units in this report are in feet unless specified otherwise.

**Alignment Name:** BL3

**Alignment Description:**

**Alignment Style:** Alignment\Baseline

		<u>Station</u>	<u>Northing</u>	<u>Easting</u>
Element: Linear				
START	( )	9000.002	1221481.344	2211562.791
PC	( )	9095.948	1221566.717	2211519.006
Tangential Direction:		N27.152°W		
Tangential Length:		95.946		
Element: Circular				
PC	( )	9095.948	1221566.717	2211519.006
HPI	( )	9149.266	1221614.159	2211494.675
CC	( )		1221703.621	2211785.947
PT	( )	9201.481	1221667.079	2211488.180
Radius:		300.000		
Delta:		20.155° Right		
Degree of Curvature (Arc):		19.099°		
Length:		105.533		
Tangent:		53.318		
Chord:		104.990		
Middle Ordinate:		4.629		
External:		4.701		
Back Tangent Direction:		N27.152°W		
Back Radial Direction:		N62.848°E		
Chord Direction:		N17.074°W		
Ahead Radial Direction:		N83.004°E		
Ahead Tangent Direction:		N6.996°W		
Element: Linear				
PT	( )	9201.481	1221667.079	2211488.180
PC	( )	9249.645	1221714.884	2211482.314
Tangential Direction:		N6.996°W		
Tangential Length:		48.164		

## Element: Circular

PC	( )	9249.645	1221714.884	2211482.314
HPI	( )	9293.602	1221758.514	2211476.960
CC	( )		1221689.306	2211273.877
PT	( )	9336.308	1221796.334	2211454.557
Radius:		210.000		
Delta:		23.645° Left		
Degree of Curvature (Arc):		27.284°		
Length:		86.663		
Tangent:		43.957		
Chord:		86.049		
Middle Ordinate:		4.455		
External:		4.551		
Back Tangent Direction:		N6.996°W		
Back Radial Direction:		N83.004°E		
Chord Direction:		N18.819°W		
Ahead Radial Direction:		N59.359°E		
Ahead Tangent Direction:		N30.641°W		

## Element: Linear

PT	( )	9336.308	1221796.334	2211454.557
PC	( )	9398.208	1221849.591	2211423.009
Tangential Direction:		N30.641°W		
Tangential Length:		61.900		

## Element: Circular

PC	( )	9398.208	1221849.591	2211423.009
HPI	( )	9609.129	1222031.063	2211315.511
CC	( )		1222022.875	2211715.537
PT	( )	9775.780	1222207.984	2211430.344
Radius:		340.000		
Delta:		63.627° Right		
Degree of Curvature (Arc):		16.852°		
Length:		377.572		
Tangent:		210.921		
Chord:		358.467		
Middle Ordinate:		51.079		
External:		60.110		
Back Tangent Direction:		N30.641°W		
Back Radial Direction:		N59.359°E		
Chord Direction:		N1.173°E		
Ahead Radial Direction:		S57.014°E		
Ahead Tangent Direction:		N32.986°E		

## Element: Linear

PT	( )	9775.780	1222207.984	2211430.344
END	( )	9876.761	1222292.687	2211485.322

Tangential Direction:	N32.986°E
Tangential Length:	100.981

# Vertical Alignment Review Report

Report Created: Monday, March 7, 2022  
Time: 11:58:12 AM

**Project:** Default

**Description:**

**File Name:** F:\7125 CMR - Wildlife Refuge Repairs\dgn\Design DGN\100%  
Design\MT\_FWS\_CMR\_61520(1)\_Sand\_Creek\_Bridge\_cor.dgn

**Last Revised:** 3/7/2022 11:57:52

**Note:** All units in this report are in feet unless specified otherwise.

**Horizontal Alignment:** BL3

**Horizontal Description:**

**Horizontal Style:** Alignment\Baseline

**Vertical Alignment:** Unnamed

**Vertical Description:**

**Vertical Style:** Alignment\Baseline

	<b>Station</b>	<b>Elevation</b>
Element: Linear		
START	9000.002	2272.344
VPC	9029.002	2271.483
Tangent Grade:	-0.030	
Tangent Length:	29.000	
Element: Symmetrical Parabola		
VPC	9029.002	2271.483
VPI	9079.002	2270.000
VPT	9129.002	2270.000
Length:	100.000	
Entrance Grade:	-0.030	
Exit Grade:	0.000	
$r = 100 * (g2 - g1) / L$ :	2.967	
$K = L / (g2 - g1)$ :	33.706	
Middle Ordinate:	0.371	
Element: Linear		
VPT	9129.002	2270.000
VPC	9409.002	2270.000
Tangent Grade:	0.000	
Tangent Length:	280.000	
Element: Symmetrical Parabola		
VPC	9409.002	2270.000
VPI	9459.002	2270.000

VPT	9509.002	2273.070
Length:	100.000	
Entrance Grade:	0.000	
Exit Grade:	0.061	
$r = 100 * (g2 - g1) / L$ :	6.139	
$K = L / (g2 - g1)$ :	16.288	
Middle Ordinate:	0.767	
Element: Linear		
VPT	9509.002	2273.070
VPC	9584.002	2277.674
Tangent Grade:	0.061	
Tangent Length:	75.000	
Element: Symmetrical Parabola		
VPC	9584.002	2277.674
VPI	9634.002	2280.744
VPT	9684.002	2280.204
VHP	9669.041	2280.285
Length:	100.000	
Entrance Grade:	0.061	
Exit Grade:	-0.011	
$r = 100 * (g2 - g1) / L$ :	-7.219	
$K = L / (g2 - g1)$ :	13.852	
Middle Ordinate:	-0.902	
Element: Linear		
VPT	9684.002	2280.204
END	9786.770	2279.094
Tangent Grade:	-0.011	
Tangent Length:	102.768	



# Horizontal Alignment Review Report

Report Created: Monday, March 7, 2022  
Time: 4:25:50 PM

**Project:** Default

**Description:**

**File Name:** F:\7125 CMR - Wildlife Refuge Repairs\dgn\Design DGN\100%Design\MT FWS  
CMR 61520(1) Siparyann\_cor.dgn

**Last Revised:** 3/7/2022 16:25:33

**Note:** All units in this report are in feet unless specified otherwise.

**Alignment Name:** BL10

**Alignment Description:**

**Alignment Style:** Alignment\Baseline

		<u>Station</u>	<u>Northing</u>	<u>Easting</u>
Element: Linear				
START	( )	1000.002	1230369.661	2206019.182
PC	( )	1035.404	1230382.273	2206052.261
Tangential Direction:		N69.130°E		
Tangential Length:		35.402		
Element: Circular				
PC	( )	1035.404	1230382.273	2206052.261
HPI	( )	1157.529	1230425.779	2206166.374
CC	( )		1231106.428	2205776.173
PT	( )	1277.662	1230502.270	2206261.578
Radius:		775.000		
Delta:		17.910° Left		
Degree of Curvature (Arc):		7.393°		
Length:		242.259		
Tangent:		122.125		
Chord:		241.273		
Middle Ordinate:		9.447		
External:		9.563		
Back Tangent Direction:		N69.130°E		
Back Radial Direction:		S20.870°E		
Chord Direction:		N60.175°E		
Ahead Radial Direction:		S38.780°E		
Ahead Tangent Direction:		N51.220°E		
Element: Linear				
PT	( )	1277.662	1230502.270	2206261.578
END	( )	1900.000	1230892.058	2206746.727
Tangential Direction:		N51.220°E		
Tangential Length:		622.338		

# Vertical Alignment Review Report

Report Created: Monday, March 7, 2022  
Time: 4:26:29 PM

**Project:** Default

**Description:**

**File Name:** F:\7125 CMR - Wildlife Refuge Repairs\dgn\Design DGN\100%Design\MT FWS  
CMR 61520(1) Siparyann\_cor.dgn

**Last Revised:** 3/7/2022 16:25:33

**Note:** All units in this report are in feet unless specified otherwise.

**Horizontal Alignment:** BL10

**Horizontal Description:**

**Horizontal Style:** Alignment\Baseline

**Vertical Alignment:** Unnamed

**Vertical Description:**

**Vertical Style:** Alignment\Baseline

	<b>Station</b>	<b>Elevation</b>
Element: Linear		
START	1460.000	2269.505
VPC	1498.500	2270.547
Tangent Grade:	0.027	
Tangent Length:	38.500	
Element: Symmetrical Parabola		
VPC	1498.500	2270.547
VPI	1541.000	2271.697
VPT	1583.500	2271.569
VHP	1574.958	2271.582
Length:	85.000	
Entrance Grade:	0.027	
Exit Grade:	-0.003	
$r = 100 * (g2 - g1) / L$ :	-3.540	
$K = L / (g2 - g1)$ :	28.247	
Middle Ordinate:	-0.320	
Element: Linear		
VPT	1583.500	2271.569
END	1700.000	2271.216
Tangent Grade:	-0.003	
Tangent Length:	116.500	