

Flight Procedures Cover Page	Task Action: FLIGHT CHECK	Task Type: STAR	Estimated Chart Date: 03/19/2026	APWS Task ID: 95E08EBDF89C48B697AFA1DA7E434C28	APWS Project ID: 1338C5C08E3C4493BAB00726E1C87F48
Procedure: MUSCL (RNAV) FOUR ARRIVAL		Enroute: YES	Specialist: Gorman, Barbara		Agreement Number:
Airport ID: KMSP			Airport City: MINNEAPOLIS		State: MN
Facility ID:	Facility Type:	Flight Inspection Remark Type: New FC Slot			
<div>Procedure Comments: APPROVAL LETTER (2): DESCENT GRADIENT GREATER THEN MAXIMUM PERMISSIBLE GRADIENT ALLOWED AND LEG LENGTH REQUIRED FOR DECELERATION. MSP VORMON ACTIVE DATA USED FOR KRSW AIRPORT AND RUNWAYS. CONTACT: CASIMIR TABAKA: 405.954.7931</div> <div>06/05/2025</div> <div><div>QUALITY 14 CHECKED</div><div>QUALITY 38 CHECKED</div></div>					

Flight Procedures Cover Page	Task Action: FLIGHT CHECK	Task Type: STAR	Estimated Chart Date: 08/07/2025	APWS Task ID: 95E08EBDF89C48B697AFA1DA7E434C28	APWS Project ID: 1338C5C08E3C4493BAB00726E1C87F48
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# Federal Aviation Administration

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## Memorandum

Date: December 13, 2024  
To: Charles R Erickson, (Acting) Fight Procedures Team Manager  
From: Jessica Roses, Support Manager, Airspace and Procedures  
Prepared by: Scott Enander, Task Order Manager, NAVTAC Contract  
Support  
Subject: Letter of Approval Request MUSCL STAR, KMSP

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KMSP MUSCL Standard Terminal Arrival Route (STAR): JERMN to MUSCL Descent Gradient.

**KMSP MUSCL Standard Terminal Arrival Route (STAR): JERMN to MUSCL Descent Gradient.**

Currently, FAAO 8260.3G, PARA 2-2-8a (1), The STAR's maximum permissible descent gradient is 330 ft/nm (approximately 3.11 degrees). JERMN has a restriction of AT OR ABOVE FL220, and MUSCL has a restriction of AT OR ABOVE 17000MSL. The descent gradient (368.10 ft/nm) from JERMN to MUSCL is greater than the maximum permissible gradient allowed. Flight Standards approval is required.

The MUSCL STAR serves Minneapolis – St Paul International/Wold-Chamberlain Airport. The altitude restrictions on the MUSCL STAR are designed to separate aircraft on the procedure from either adjacent airspace or other traffic. The deviation from Descent Gradient criteria does not introduce any new risk into the system. Additionally, the procedure does not have any reported issues by either air traffic control or the airline industry.

Therefore, ZMP is requesting a Letter of Approval to utilize the altitudes at JERMN (AT OR ABOVE FL220) to MUSCL (AT OR ABOVE 17000) resulting in a descent gradient of 368.10 ft/nm as developed for the MUSCL STAR.

Sincerely,

Jessica Roses  
Support Manager, Airspace & Procedures  
Minneapolis ARTCC, MN



# Federal Aviation Administration

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KMSP MUSCL Standard Terminal Arrival Route (STAR): KROIX to TRTEL Leg Length for Deceleration.

KMSP MUSCL Standard Terminal Arrival Route (STAR): ZASKY to CMMOE Leg Length for Deceleration.

**KMSP MUSCL Standard Terminal Arrival Route (STAR): ZASKY to CMMOE Leg Length for Deceleration.**

Currently, criteria evaluate loss of altitude and airspeed wholly contained within a single segment, not through the entirety of the flown procedure. FAAO 8260.3G, PARA 2-2-10 prescribes allowable deceleration distances for STAR development.

The length of the leg from ZASKY to CMMOE is 3.55 NM. This leg must be at least 5.14 NM long due to deceleration from 250.0 KIAS to 230 KIAS between 9000.0 ft. MSL to 8000.0 ft MSL. Flight Standards approval is required.

The total distance from ZASKY to CMMOE is 3.55 NM and the segment requires the aircraft to lose 1000ft of altitude and 20 KTS of airspeed. Using formula 2-2-2 of 8260.3G, computes a minimum deceleration distance of 5.14 NM. Industry indicates that the procedure can be easily managed without increased energy management actions by the flight crew and these altitude restrictions and speed restrictions have been published on this procedure for several years without any reported issues.

Sincerely,

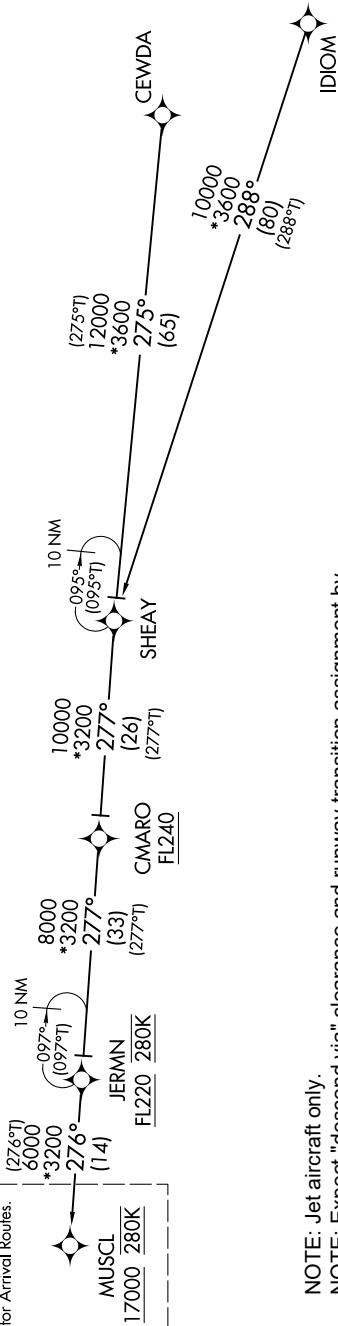
Jessica Roses  
Support Manager, Airspace & Procedures  
Minneapolis ARTCC, MN

RNAV 1 - DME/DME/IRU or GPS.  
RADAR required.

PROTOTYPE-NOT FOR NAVIGATION

MINNEAPOLIS APP CON  
126.35 335.5  
D-ATIS ARR  
135.35 239.275

See following page  
for Arrival Routes.

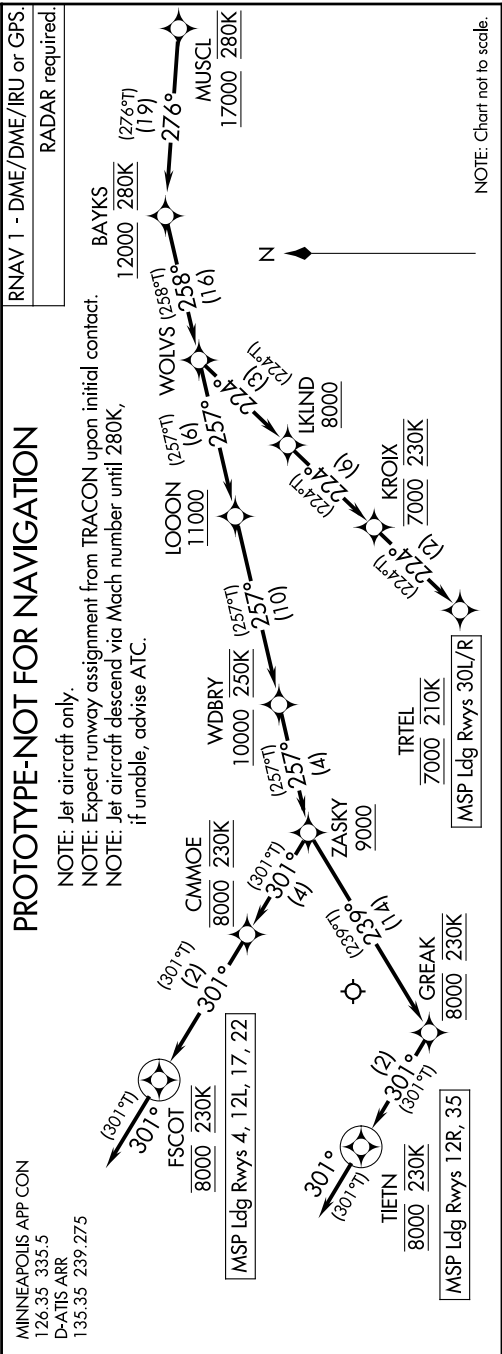


NOTE: Jet aircraft only.  
NOTE: Expect "descend via" clearance and runway transition assignment by Center. Approach will assign landing Runway.  
NOTE: Jet aircraft descent via Mach number until 280K, if unable, advise ATC.

- CEWDA TRANSITION (CEWDA.MUSCL4)
- CMARO TRANSITION (CMARO.MUSCL4)
- IDIOM TRANSITION (IDIOM.MUSCL4)
- JERMN TRANSITION (JERMN.MUSCL4)
- SHEAY TRANSITION (SHEAY.MUSCL4)

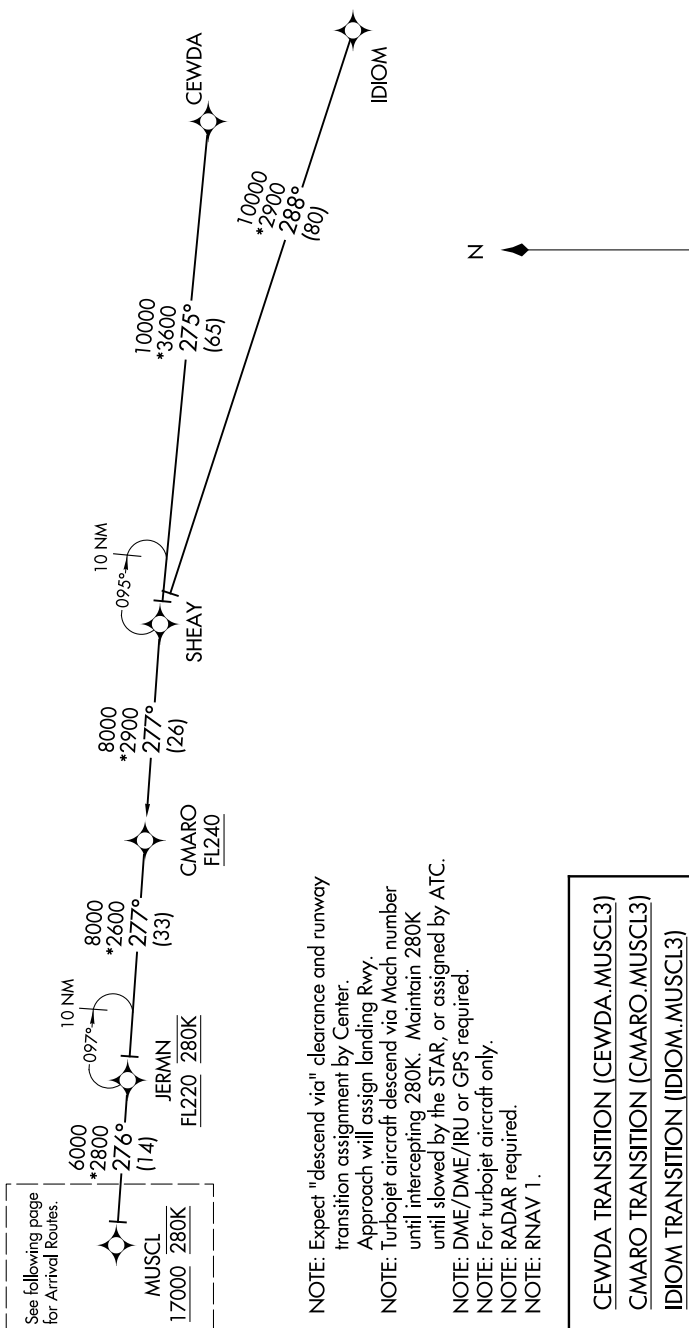
NOTE: Chart not to scale.

(CONTINUED ON FOLLOWING PAGE)



## MUSCL THREE ARRIVAL (RNAV) Transition Routes AL-264 (FAA) MINNEAPOLIS, MINNESOTA

MINNEAPOLIS APP CON  
126.35 335.5  
D-ATIS ARR  
135.35 239.275



NOTE: Chart not to scale.

(CONTINUED ON FOLLOWING PAGE)

CEWDA TRANSITION (CEWDA.MUSCL3)  
CMARO TRANSITION (CMARO.MUSCL3)  
IDIOM TRANSITION (IDIOM.MUSCL3)  
JERMN TRANSITION (JERMN.MUSCL3)  
SHEAY TRANSITION (SHEAY.MUSCL3)

NOTE: Expect "descend via" clearance and runway transition assignment by Center.  
Approach will assign landing Rwy.

NOTE: Turbojet aircraft descend via Mach number until intercepting 280K. Maintain 280K until slowed by the STAR, or assigned by ATC.

NOTE: DME/DME/IRU or GPS required.

NOTE: For turbojet aircraft only.

NOTE: RADAR required.

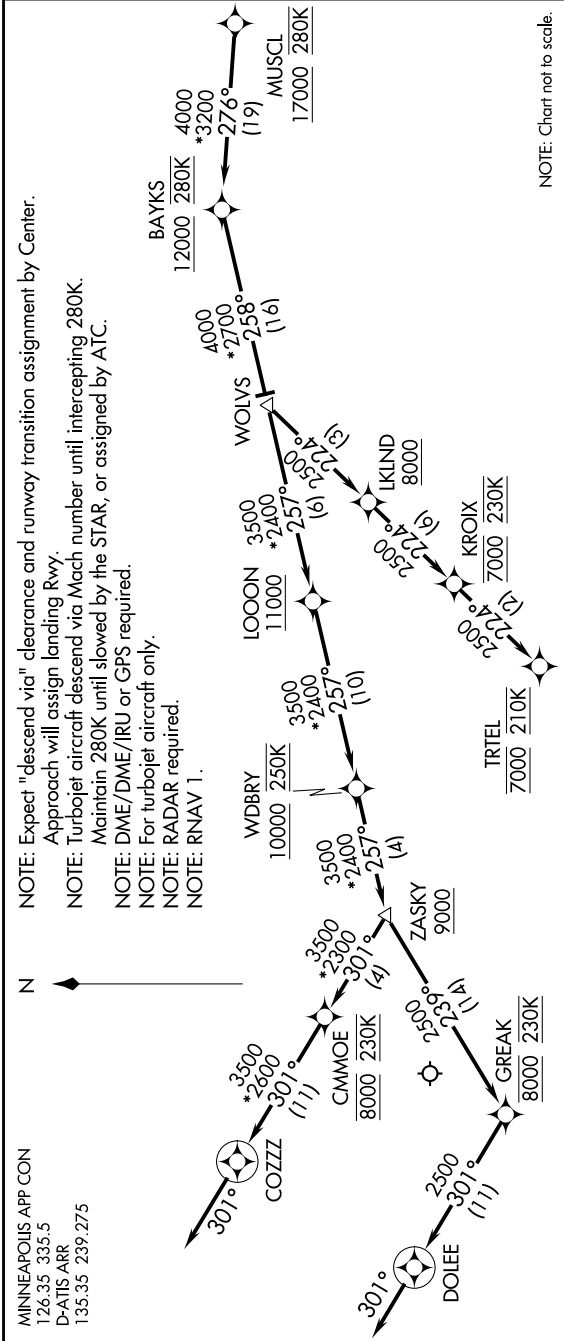
NOTE: RNAV 1.

## MUSCL THREE ARRIVAL (RNAV) Transition Routes

(MUSCL.MUSCL3) 05JAN17

MINNEAPOLIS, MINNESOTA

MINNEAPOLIS-ST PAUL INTL/WOLD-CHAMBERLAIN (MSP)



ARRIVAL ROUTE DESCRIPTION

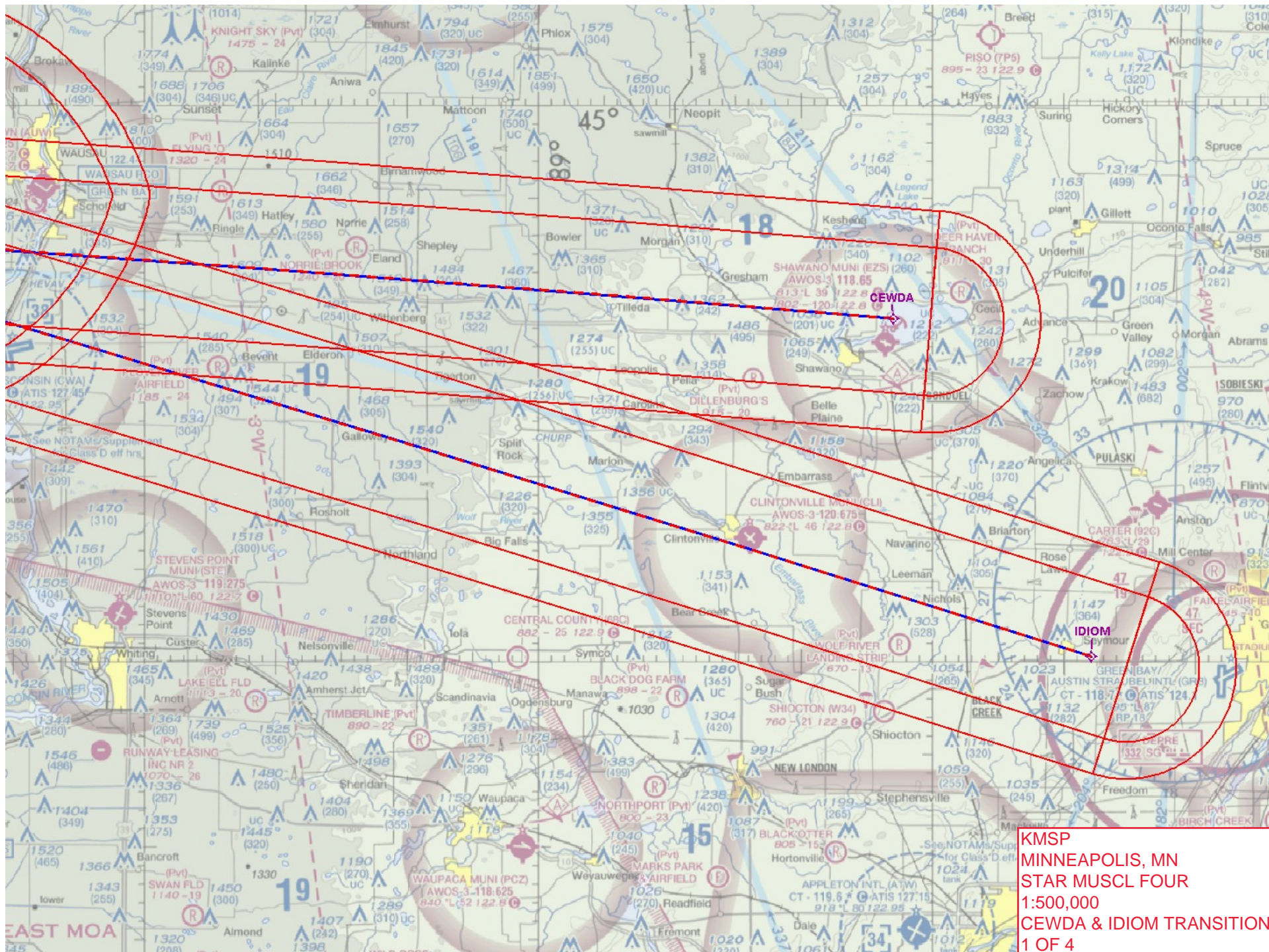
From MUSCL on track 276° to cross BAYKS at or above 12000 and at 280K, then on track 258° to WOLVS.

LANDING RUNWAYS 4, 12L, 17, 22: From WOLVS on track 257° to cross LOOON at or above 11000, then on track 257° to cross WDBRY at or above 10000 and at 250K, then on track 257° to cross ZASKY at or above 9000, then on track 301° to cross CMMOE at 8000 and at 230K, then on track 301° to COZZZ, then on track 301°. Expect RADAR vectors to final approach course.

LANDING RUNWAYS 12R, 35: From WOLVS on track 257° to cross LOOON at or above 11000, then on track 257° to cross GREAK at or above 10000 and at 250K, then on track 257° to cross ZASKY at or above 9000, then on track 239° to cross GREAK at 8000 and at 230K, then on track 301° to DOLEE, then on track 301°. Expect RADAR vectors to final approach course.

LANDING RUNWAYS 30L/R: From WOLVS on track 224° to cross LKIND at or above 8000, then on track 224° to cross KROIX at 7000 and at 230K, then on track 224° to cross TRTEL at 7000 and at 210K. Expect RNAV (RNP), RNAV (GPS), or ILS approach or RADAR vectors to final approach course.





KMSP  
MINNEAPOLIS, MN  
STAR MUSCL FOUR  
1:500,000  
CEWDA & IDIOM TRANSITION  
1 OF 4



