Montana
Engineering Practice Planning and Design Guide
for
Waterspreading System

		References	✓
RESOURCE INVENTORY		NPM 506.10 MIM Ch. 9	
1.	Find alternative sites which can physically be used for waterspreading. List the positive and negative aspects of each site.	Field invest., Aerial photo, quad sheet	❒ ×
2.	Other general topographic information. This initial investigation can usually be done by observation, quad sheet, photos or a few shots with an engineering level.		❒ ×
3.	Other data on water source:		
	▪ Drainage area, characteristics of drainage area	EFH Ch 2	❒ ×
	▪ Duration of flow (landuser, historical records)		❒ ×
	▪ Sediment potential		❒ ×
	▪ Quality of water (test if necessary)	MIM ch 3	❒ ×
	▪ Could additional sources be diverted into waterspread area?	Photo, Quad, Landuser	❒ ×
	▪ Do water rights cover proposed water use?	Landuser	❒ ×
4.	Measure area of land available for waterspreading.	Photo, Quad	❒ ×
5.	Is site accessible during poor weather?	Landuser	❒ ×
6.	Information from operator:		
	▪ Whether or not farming will be done over top of dikes. If so, what kind of equipment will be used.		❒ ×
	▪ Is there a preference as to dike sideslopes?		❒ ×
	▪ What is the labor situation? Can constant supervision be given to the system as it functions?		❒ ×
	▪ What will be grown and how will the system be managed?		❒ ×
	▪ Will construction be done by owner or contractor?		❒ ×
INTERPRETING, ANALYZING, AND EVALUATING			
1.	Is additional hay needed? How much?		❒
2.	Are there other alternatives for producing hay? (Improving dryland plantings, improving management of existing systems, full service irrigation.)		❒

		References	✓
3.	Determine if soils are suited for waterspreading. Consider salinity and alkalinity. Available Water Capacity (AWC) should be at least 4.0" in root zone.	Standard 640	❒ ×
4.	Determine if topography is suited for waterspreading. Slopes beyond 1% are usually not feasible, require detailed economic analysis.	MIM Ch 5	❒ ×
5.	Compute watershed yield. Is drainage area large enough? Too large? Complex systems should operate eight out of ten years. Simple systems should operate at least half the time.	FOTG 640 MIM Ch 5	❒ ×
6.	Can crops withstand inundation during spring thaw? During growing season?		❒ ×
7.	Is owner aware of potential cost and able to do the job?		❒ ×
8.	Can water be diverted by simple structures? Will pumping be required?		❒ ×
9.	If the site is within a flood plain, what will the effect of a flood be on the dikes, culverts, structures and on the existing stream?	NPM MT506.17 NEM 503	❒
IMPLEMENTING DECISIONS		NPM 506.10	
Approval Authority and Hazard Class		NEM MT501.04	
1.	Determine approval authority for diversions, structures, ditches, etc. Request appropriate assistance.	Individual Approval Authority	❒ ×
2.	Determine hazard class of earth dam diversion structure, if there is one.	NEM MT501.04	❒
Collect Final Data for Design			
1.	Additional detailed engineering surveys which were not obtained during initial planning.	TR62 EFH Ch. 1	
	▪ Topographic survey of spreading area (grid, cross sections, stadia or EDM).		❒
	▪ Detailed topo or sections at diversion site.		❒
2.	Geologic investigation. Borings as required at diversion site and questionable areas at dike sites.	NEH 531	❒
System Design		FOTG 640	
1.	Hydrology.		
	▪ Peak flow determination (only if needed to design diversion)	EFH Ch 2	❒
	▪ Watershed water yield and expected frequency of flow		❒ ×
	▪ Watershed sediment yield		❒

	References	✓
2. Diversion design.		
▪ Embankment type	FOTG 348	
Control elevations and freeboard		❒ ×
Sideslopes, top width, cutoff		❒ ×
Emergency spillway		❒ ×
Principal spillway		❒ ×
Turnout gate or control		❒ ×
Slope protection		❒
Fencing		❒
▪ Structural type	FOTG 587	
Hydraulic sizing		❒ ×
Control elevations		❒ ×
Structural design		❒ ×
▪ Diversion ditch	FOTG 582, 362	
Size, grade, water surface elevations		❒ ×
Slope protection		❒
3. Dike design.	FOTG 640	
▪ Field slope vs. storage depth vs. size of dike and spacing	EFH 6,9,13	❒ ×
▪ Side slopes and top width		❒ ×
▪ Alignment		❒ ×
▪ Emergency spillway around end of dike		
4. Water control structure and pipe designs.	FOTG 587	
▪ Pipe through dikes	EFH Ch 3,6	
Pipe type and size		❒ ×
Inlet type and dimensions		❒ ×
Table of pipe, inlet sizes, lengths and elevations		❒ ×
▪ Disposal of excess water back to watercourse	EFH Ch 3,6,7	
Decide what to use (riprap, pipe, structure, grass waterway)	EFH Ch 3,6,7	❒ ×
Design the facility		❒ ×

	References	✓
5. Critical area seeding design.	FOTG	❒ ×
6. Quantity calculations (if needed for cost share, bidding or other reasons).		
▪ Dike, diversion, spillway earthwork quantities		❒
▪ Land smoothing quantities		❒
▪ Pipe, weir, concrete, timber, seeding quantities		❒
Drawings	EFH Ch 5 MT Draft Guide	
Minimum drawings shall include:		
▪ Location map or enough description on plan view map to adequately locate job.		❒ ×
▪ Plan view map showing location and layout of all dikes, ditches, diversions, structures, pipes and spillways.		❒ ×
▪ Typical dike cross sections		❒ ×
▪ Profiles if needed to define ditch or spillway grades		❒ ×
▪ Table or drawing notes showing elevations and dimensions of all pipes, structures, dikes and spillways.		❒ ×
Layout	NEM 540.03 EFH Ch 1	
1. Set centerline, offset, toes or grade stakes as needed to adequately define the job on the ground. Minimum is offset stakes at 100 foot intervals for dikes, ditches and diversions, location and grade stakes for structures.		❒ ×
2. If earth quantities are required, survey information of an extent adequate to define the quantities shall be obtained.		❒
Compliance Checking		
1. Dikes		
▪ Run profiles on top of earth dikes, spillways and diversions.		❒ ×
▪ Cross sections at selected locations on earth structures. Minimum 400 foot intervals between sections.		❒ ×
2. Structures		
▪ Measure and record dimensions and key elevations on all structures.		❒ ×
▪ Record notes on the type and quality of materials and workmanship.		❒ ×

	References	✓
3. Vegetative measure		
▪ Check that critical area seeding has been completed properly.		❒ ×
4. As-built drawings prepared.		❒ ×

× This activity or documentation is usually required on each job.