Surface Irrigation System
Detailed Evaluation Graded Border Worksheet

Land user _____ Field office _____

Field name/number _____

Observer _____ Date _____ Checked by _____ Date _____

Field Data Inventory:

Field area _____ acres

Border number _____ as counted from the _____ side of field

Crop _____ Root zone depth _____ ft MAD _____%

Stage of crop _____

Soil-water data for controlling soil:

Station _____ Moisture determination method _____

Soil series name _____

Depth	Texture	AWC (in)*	SWD (%)*	SWD (in)*
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
	Total	0		0

MAD, in = $\frac{\text{MAD, \% x total AWC, in}}{100}$ = _____ = _____ in

Comments about soils: _____

_____

Typical irrigation duration _____ hr, irrigation frequency _____ days

Typical number of irrigation's per year _____

Annual net irrigation requirement, NIR (from irrigation guide) _____ in

Type of delivery system (gated pipe, turnouts, siphon tubes) _____

_____

Delivery system size data (pipe size & gate spacing, tube size & length, turnout size) _____

Border spacing _____, Strip width _____, Wetted width _____, Length _____

Field Observations:

Evenness of water spread across border _____

_____

Crop uniformity _____

_____

Other observations _____

_____

NOTE: MAD = Management allowed deficit AWC = Available water capacity SWD = Soil water deficit

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Detailed Evaluation Level Border and Basins Worksheet

1. Basin area (A):

$$A = \frac{\text{Length} \times \text{Width}}{43{,}560} = \frac{\_\_\_\_\_ \times \_\_\_\_\_}{46{,}560} = \_\_\_\_\_ \text{ acres}$$

2. Gross application, F_g, in inches:

$$F_g = \frac{\text{Total irrigation volume, in ac-in}}{\text{A, ac}} = \_\_\_\_\_ = \_\_\_\_\_ \text{ in}$$

3. Amount infiltrated during water inflow, V_i:

V_i = Gross application - Depth infiltrated after turnoff = _____= _____ in

4. Deep percolation, DP, in inches:

DP = Gross application - Soil water deficit, SWD = _____ = _____ in

$$\text{DP, in \%} = \frac{\text{(Soil water depletion, DP in inches)} \times 100}{\text{Gross application, } F_g} = \_\_\_\_\_ = \_\_\_\_\_ \%$$

5. Application efficiency, E_a:

Average depth of water stored in root zone = Soil water deficit, SWD, if the entire root zone average depth will be filled to field capacity by this irrigation.

$$E_a = \frac{\text{(Average depth stored in root zone, } F_n) \times 100}{\text{Gross application, } F_g} = \_\_\_\_\_ = \_\_\_\_\_ \%$$

6. Distribution uniformity, DU:

$$\text{Depth infiltrated low 1/4} = \frac{\text{(max intake - min intake)}}{8} + \text{min intake}$$

$$= \frac{\_\_\_\_\_}{8} + \_\_\_\_\_ = \_\_\_\_\_$$

$$DU = \frac{\text{Depth infiltrated low 1/4}}{\text{Gross application, } F_g} = \_\_\_\_\_ = \_\_\_\_\_$$

7. Application efficiency, low 1/4, E_q:

$$E_q = \frac{DU \times E_a}{100} = \_\_\_\_\_ = \_\_\_\_\_ \%$$

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1. Present management
   Estimated present average net application per irrigation = _____ inches

   Present annual gross applied = $\frac{(\text{net applied per irrigation}) \times (\text{number of irrigations})}{\text{Application efficiency, low 1/4, } E_q} \times 100$

   = _____ x 100 = _____ inches

2. Potential management
   Recommended overall irrigation efficiency, E_{des} _____

   Potential annual gross applied = $\frac{\text{Annual net irrigation requirements} \times 100}{E_{des}}$

   = _____ = _____ inches

3. Total annual water conserved:
   = $\frac{(\text{resent gross applied, in - potential gross applied, in}) \times \text{area irrigated, acres}}{12}$

   + _____ = _____ ac-ft

4. Annual potential cost savings
   From pumping plant evaluation:

   Pumping plant efficiency _____ Kind of fuel _____
   Cost per unit of fuel _____ Fuel cost per acre-foot $ _____

   Cost savings = (fuel cost per acre foot) x (water conserved per year, in ac-ft)

   = _____ x _____ = $ _____

Water purchase cost per acre-foot, per irrigation season _____

Water purchase cost savings = (Cost per acre-foot) x (water saved per year, in acre-feet)

= _____ = $ _____

Potential cost savings = pumping cost + water purchase cost = _____ = $ _____

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Recommendations:

Surface Irrigation System
Detailed Evaluation Level Border and Basins Worksheet

Inflow Data

Type of measuring device _____

Clock 1/ time	Elapsed time (min)	Δ T (min)	Gage H (ft^3/s)	Flow rate (ft^3/s)	Average flow rate (ft^3/s)	Volume (ac-in) 2/	Cum. volume (ac-in)
Turn on							
Turn off							

Total volume (ac-in) _____

Average flow:

$$\text{Average flow} = \frac{\text{(Total irrigation volume, in ac-in)}}{\text{Inflow time, in minutes}} \times 60.5 = \_\_\_\_\_ = \_\_\_\_\_ \ ft^3/s$$

Unit:

$$q_u = \frac{\text{Average inflow rate, in } ft^3/s}{\text{Border spacing}} = \_\_\_\_\_ = \_\_\_\_\_ \ ft^3/s/ft$$

1/ Use a 24-hour clock reading; i.e., 1:30 p.m. is recorded as 1330 hours.
2/ Flow rate to volume factors:

To find volume using ft^3/s: volume (ac-in) = .01653 x time (min) x flow (ft^3/s)
To find volume using gpm: volume (ac-in) = .00003683 x time (min) x flow (gpm)

Surface System
Detailed Evaluation Level Border and Basins Worksheet

Advance - Recession Data

Station (ft)	Elevation (ft)	Advance time 1/ (hr: min)	Recession time 1/ (hr: min)	Opportunity time To (min)	Intake 2/ (in)	Minimum maximum intake (in)
Total	0			0		

Water surface elevation at water turnoff _____ ft 3/

Average field elevation = $\frac{\text{elevation total}}{\text{no. of elevations}}$ = _____ = _____ ft

Depth infiltrated after water turnoff
= (water surface at turnoff - average field elev) x 12

= (_____ - _____ x 12 = _____ in

Average opportunity time = $\frac{\text{total opportunity time}}{\text{no. of sample locations}}$ = _____ = _____ min

1/ Use 24-hour clock time. As a minimum, record times at upper end, mid point.
2/ Obtain intake from plotted intake curve.
3/ Water surface elevation should be read to nearest 0.01 ft.