

TRANSFERABILITY OF HYDROMETEOROLOGICAL PROCESS AND MODEL STUDY FINDINGS TO NORTHERN ENGINEERING DESIGN APPLICATIONS

**IP3 Workshop #1
October 19, 2006**

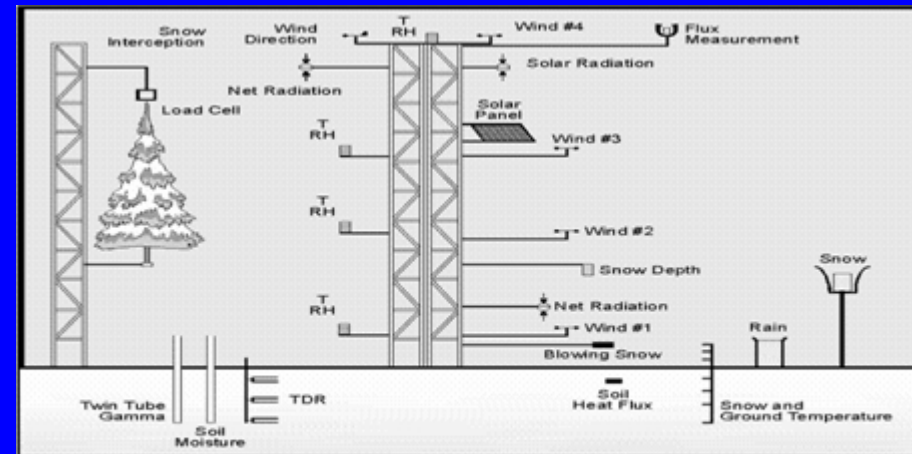
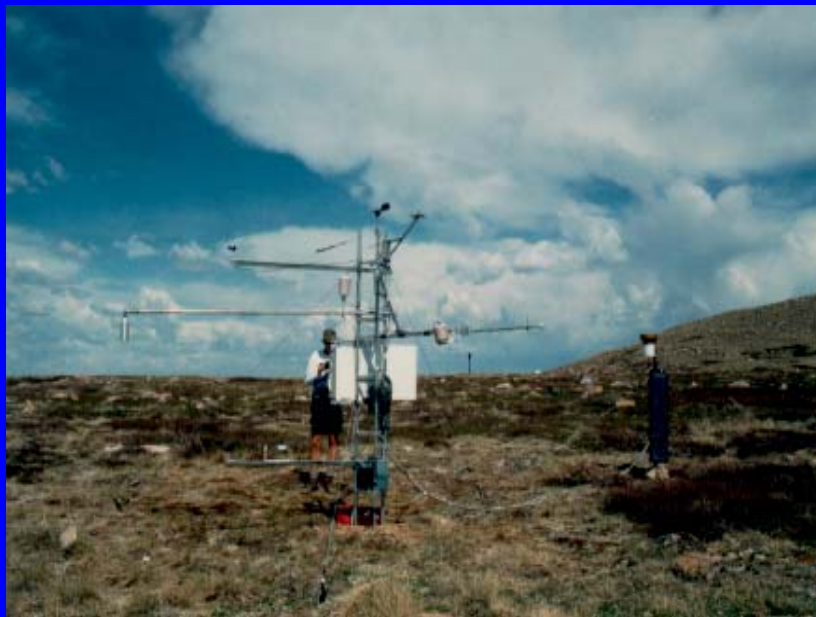
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5.4.

Yukon

WOLF CREEK RESEARCH BASIN

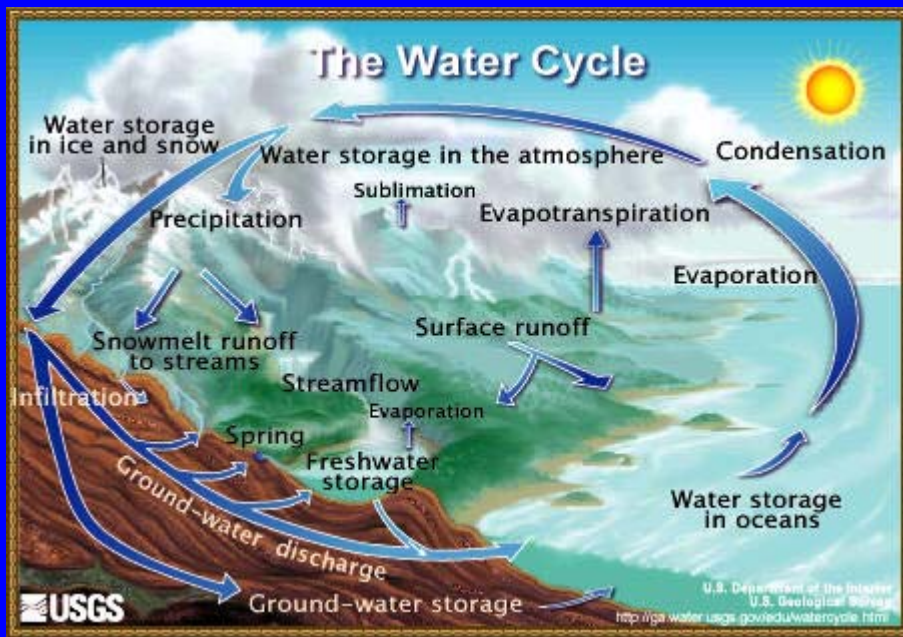
- Established 1992 for Hydrologic Model Development / Calibration Purposes
- Developed into an Integrated Study of Hydrometeorological Processes and Climate Research



Wolf Creek Tower Schematic

WOLF CREEK RESEARCH

State of the Art Cold Regions Process Studies Carried Out in Wolf Creek



- Precipitation / Snowpack Variability
- Melt Dynamics
- Frozen Ground Effects (evapotranspiration, infiltration, runoff pathways)
- Storage (soil moisture /groundwater)
- Streamflow Characterization
- Permafrost Distribution

WOLF CREEK RESEARCH

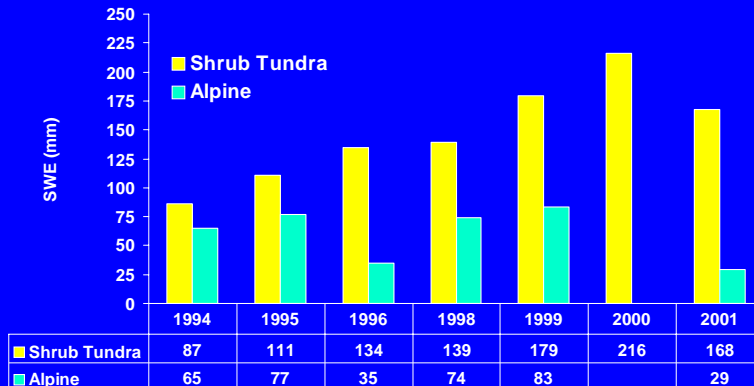
Snowpack Accumulation, Redistribution and Melt is Variable



- Blowing snow transports 80 % from alpine

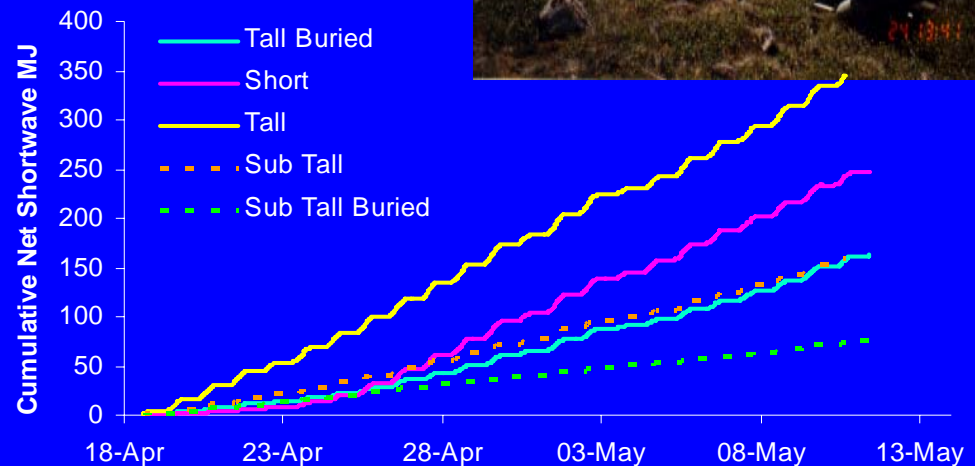
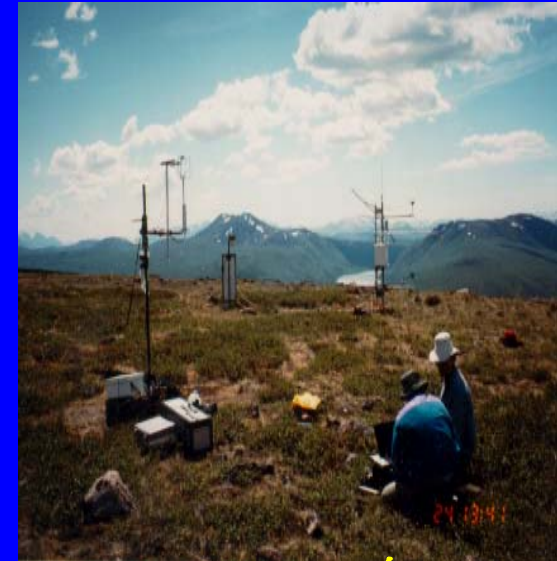
- Forest sublimation accounts for 60 % of snowfall

- Snowmelt is 300 % faster in the alpine than forest



WOLF CREEK RESEARCH

Studies Indicate that Evapotranspiration is 50 % Higher in Forested Areas



ANVIL RANGE MINING CORPORATION FARO MINE COMPLEX



- SRK Consulting Ltd
 - Deloitte & Touche
- Could we Transfer Wolf Creek Finding to Faro Waste Rock Dumps to Develop a Water Balance?

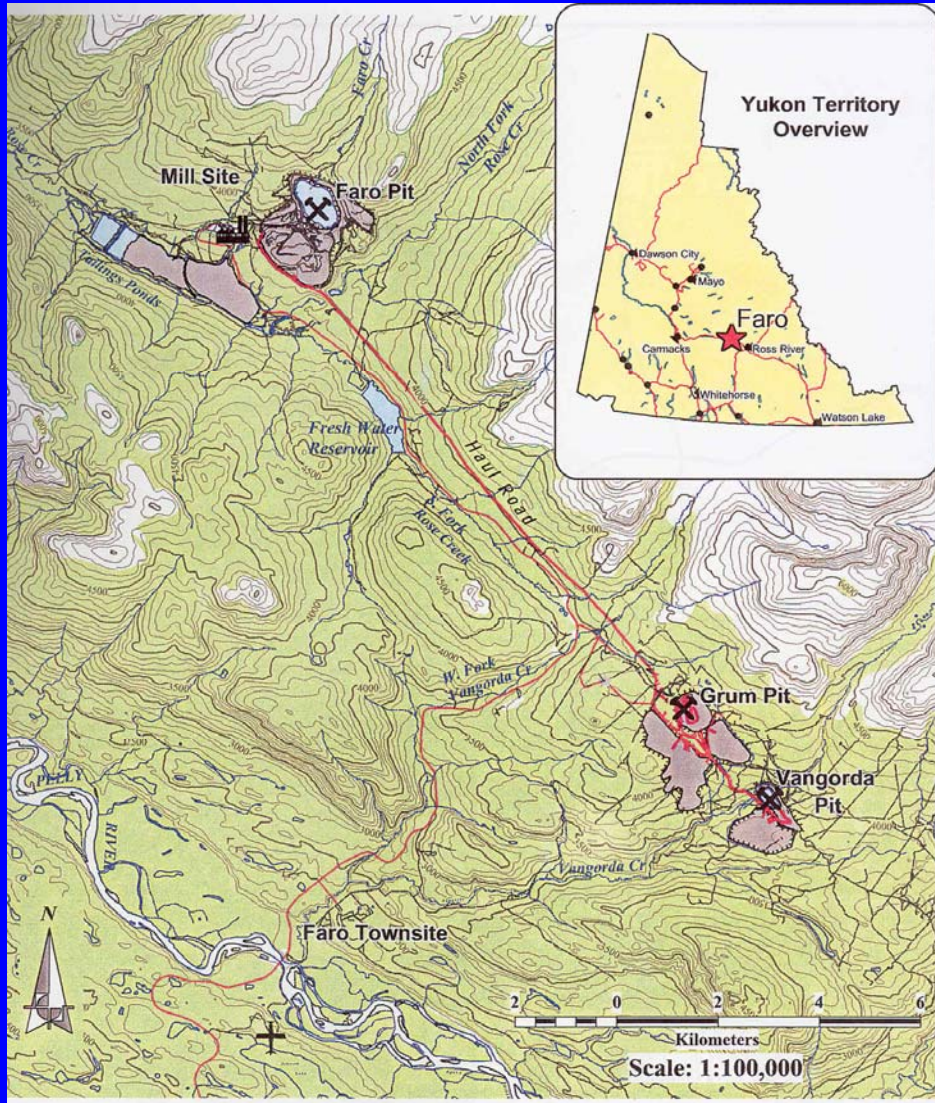
Faro Waste Rock Dump

INVESTIGATION OF ANVIL RANGE MINING CORPORATION (FARO) WASTE DUMP

WATER BALANCE

- Co-Investigators:
 - Raoul Granger & Newell Hedstrom (NWRI)
- Overall Objective:
 - Estimate Waste Rock Dump Recharge for Determining Contaminant Seepage
- 2 Year Study
 - Year 1: Develop Water Balance using Transposed Meteorological Data
 - Year 2: Develop Water Balance using Site Meteorological Data

ANVIL RANGE MINING CORP MINESITE



- Abandoned Lead-Zinc Mine
- 3 Waste Rock Dumps
 - Faro (334 ha)
 - Grum (160 ha)
 - Vangorda (71 ha)

ANVIL RANGE MINING CORP MINESITE



- 6 HRUs
 - Flat
 - Slopes (E.W.N.S)
 - Bubble



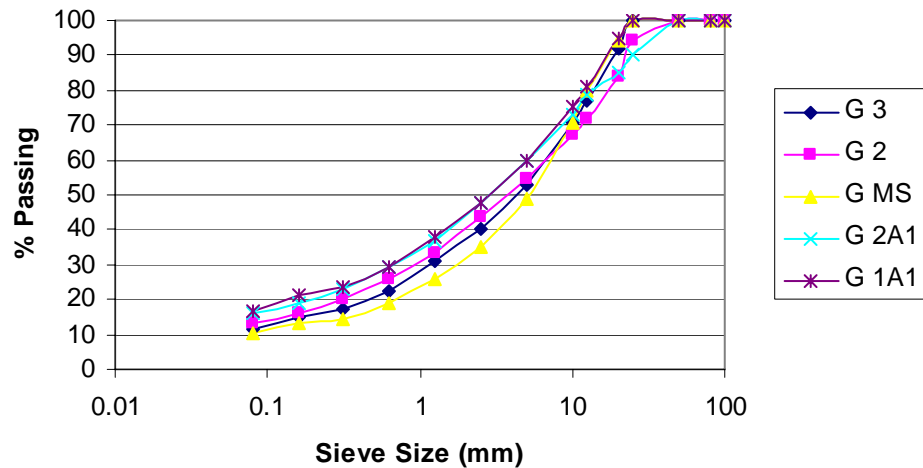
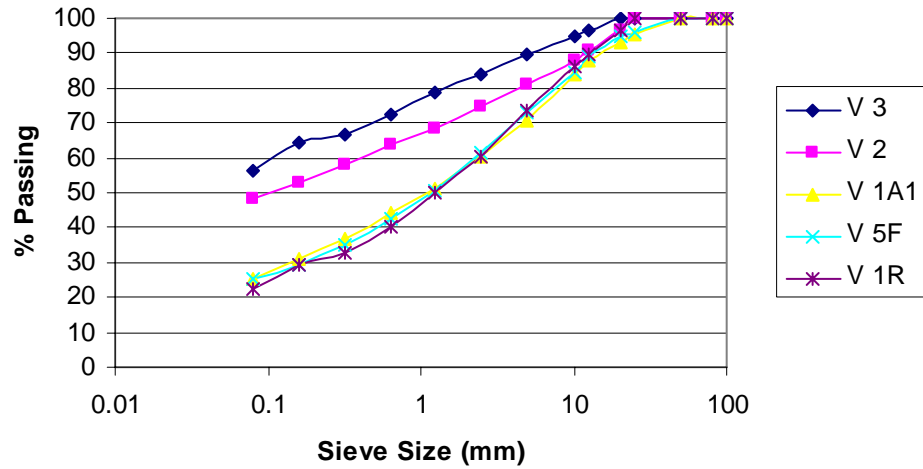


Met Stations

Snow Surveys



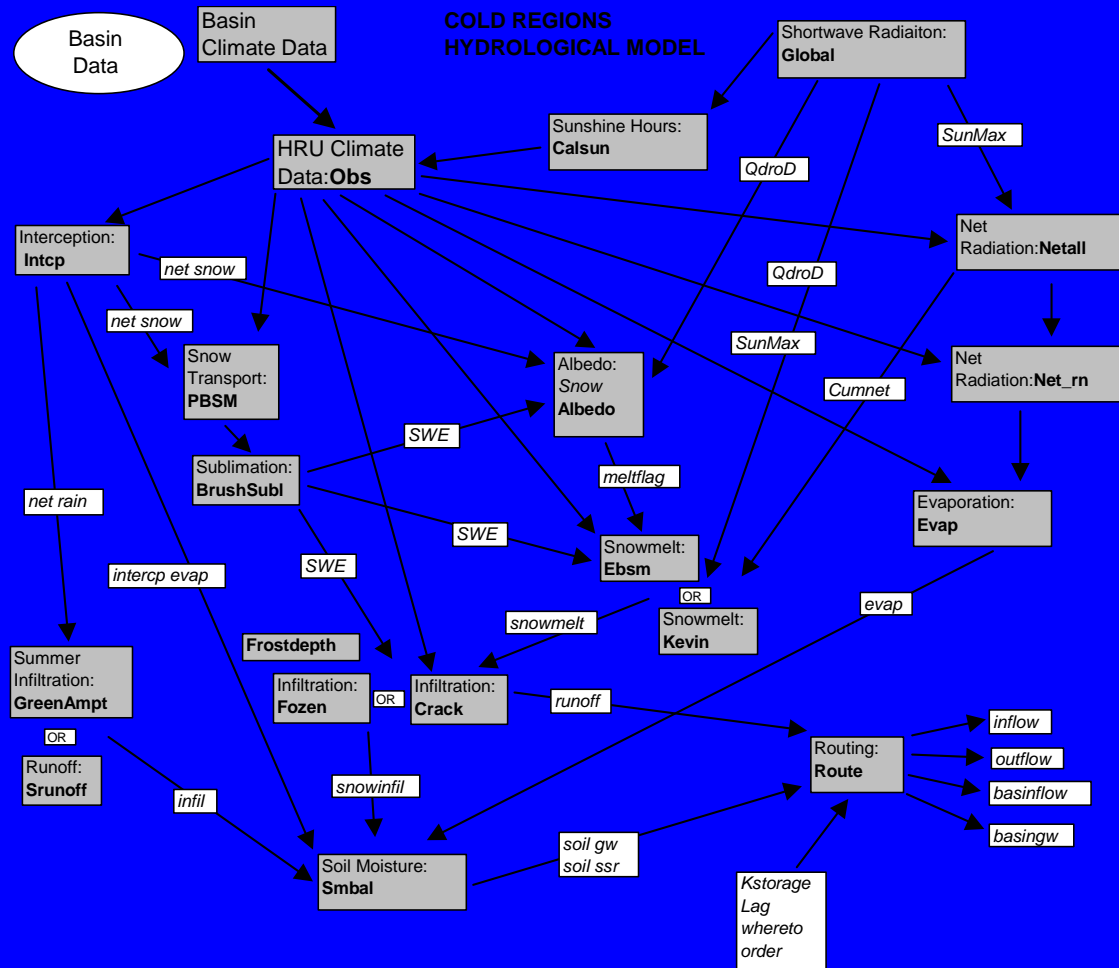
Material Characterization



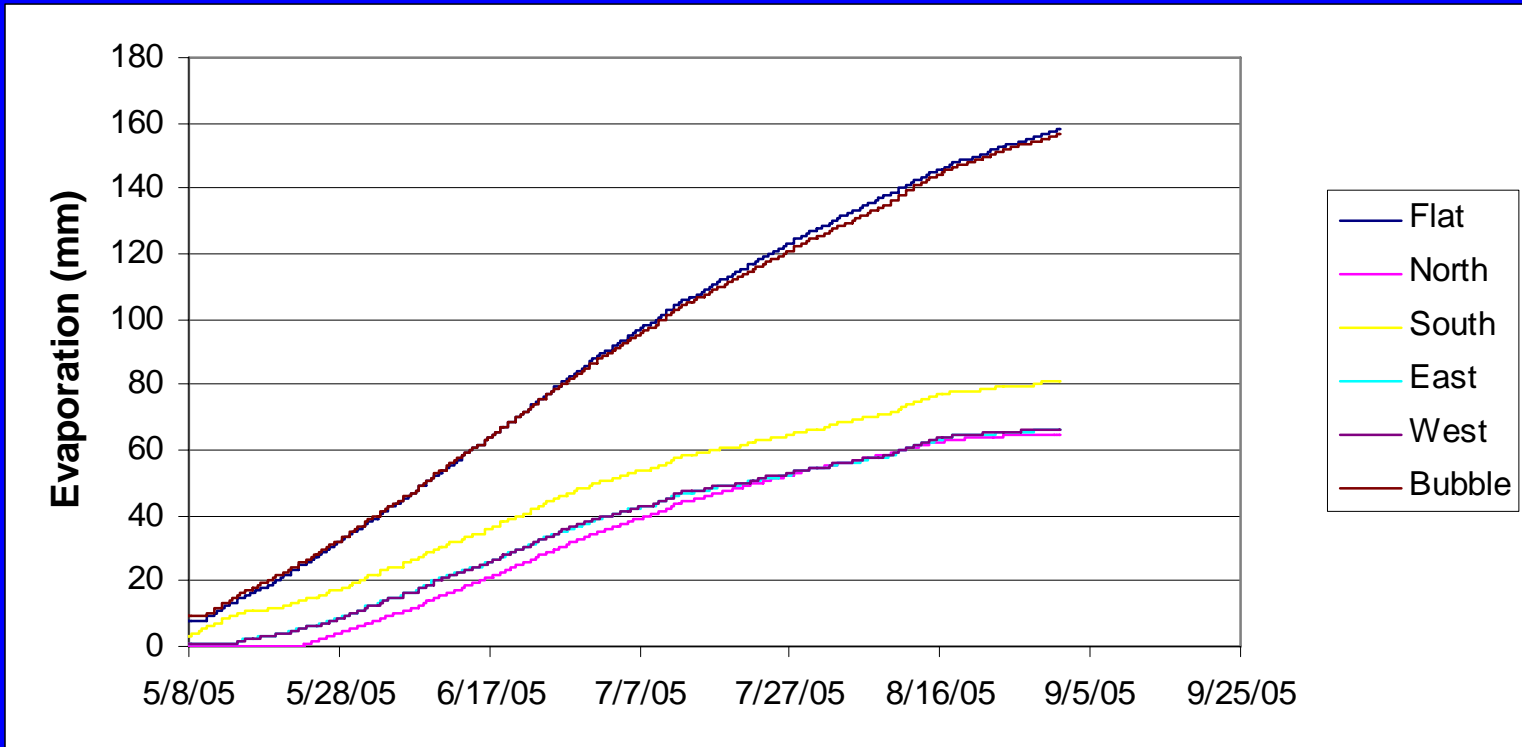
Infiltration Studies



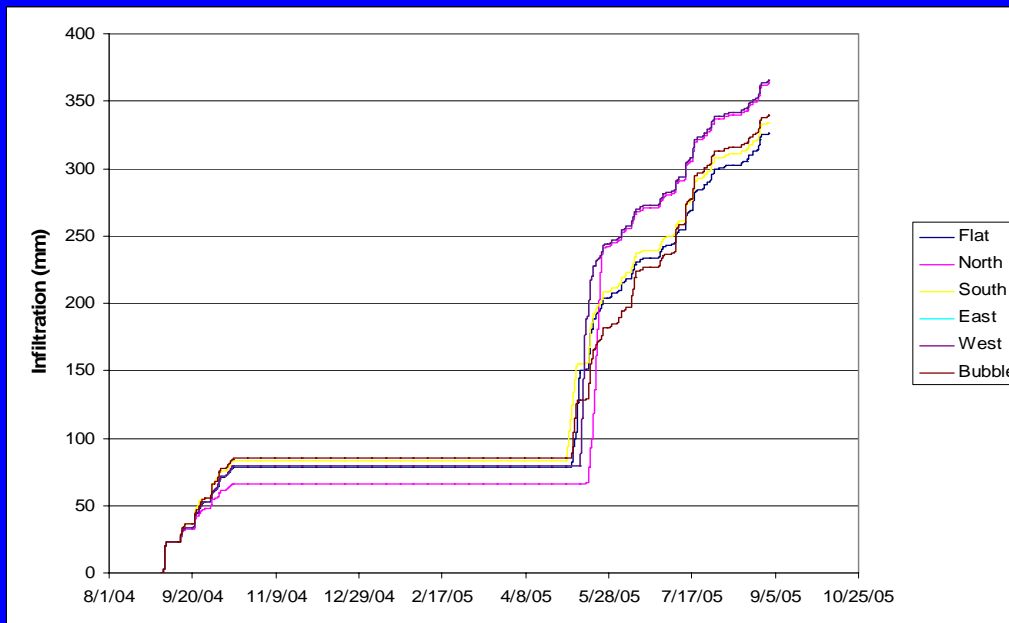
COLD REGIONS HYDROLOGICAL MODEL



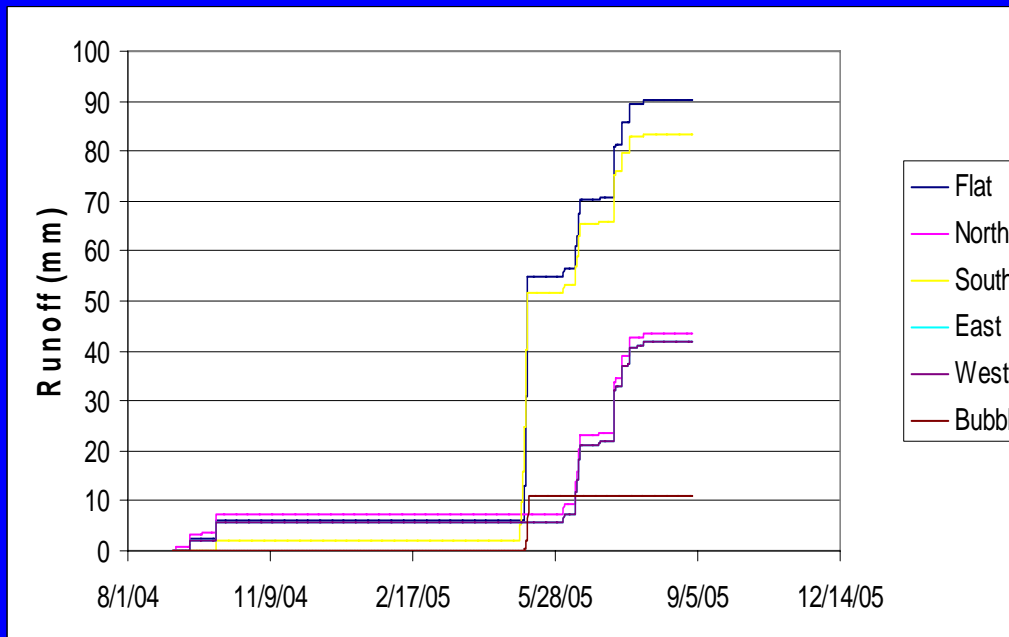
CUMULATIVE EVAPORATION



Cumulative Infiltration



Cumulative Runoff



SUMMARY

- Snow Accumulation Greater at Grum and Vangorda Dumps as Compared to Faro
- Rainfall Inf 2x Snowmelt Inf
- Evaporation from Flat and Bubble HRUs 2 – 2.5x other HRUs
- Snowmelt Runoff from South Facing and Flat HRUs 3x other HRUs
- Annual Recharge 50 – 60% Precipitation
- Rainfall / Soil Moisture Data Support Recharge Estimates