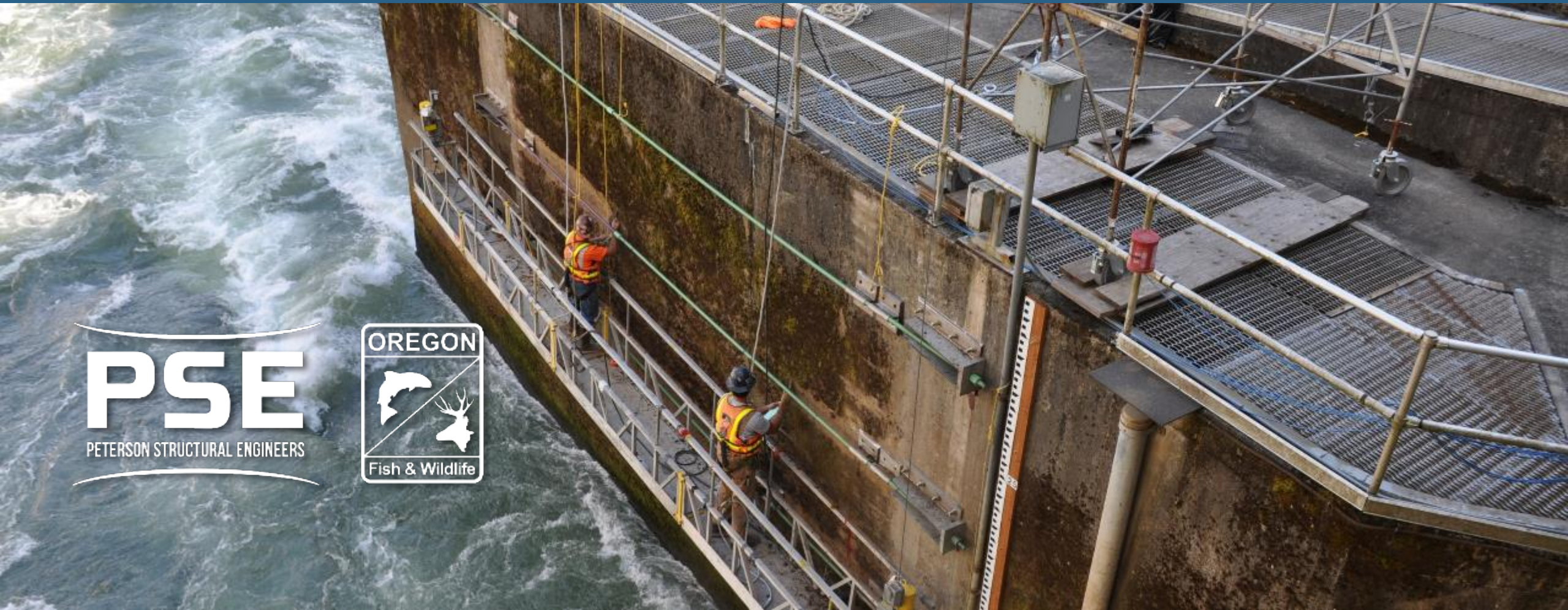


# Willamette Falls Fishway

THERMAL ACTION MITIGATION

**PSE**

PETERSON STRUCTURAL ENGINEERS





# WILLAMETTE FALLS FISHWAY

- Original design performed in 1965 and constructed in 1966
- Overall system is comprised of 3 separate fish ladders, collections bay and counting room
- Provides safe fish passage through Willamette Falls
- Focus of this presentation is Fishway #1 – the primary route for fish passage
- PSE has been providing design and consulting services throughout the fishway system since 1995
- ODFW has been an excellent client and team member in bringing this project to a successful conclusion!







# WILLAMETTE FALLS FISHWAY – Investigation

- In 2009 concerns with the stability of Fishway #1 were to be studied
- PSE's team performed:
  - Dive Investigations
  - Geotechnical Studies
  - Structural Condition Assessment
  - Installation of Monitoring Equipment
  - Assimilation of Studies and Data
  - Generation of Opinion of Causal Actions
  - Recommendations for Repairs

# WILLAMETTE FALLS FISHWAY – Investigation

- Primary foundation issues identified:
  - Scour undermining of existing foundations
  - Expanding joints
  - Concrete spalling and structural damage















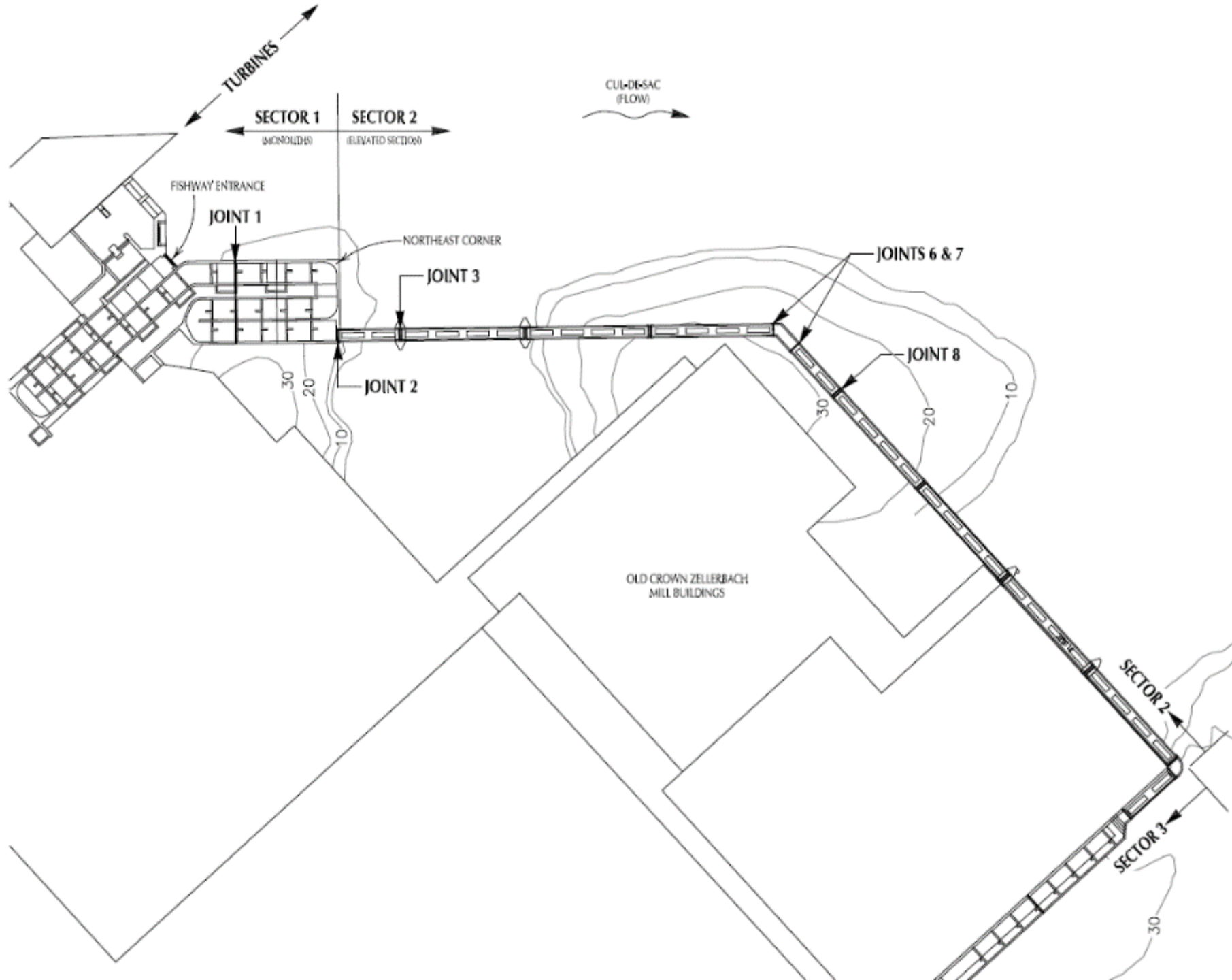
# WILLAMETTE FALLS FISHWAY – Investigation

- Structural actions monitoring
  - Installation of crack & tilt meters, air & water temperature recorders, piezometric pressure monitor
  - Initial 12-month study allowed for a full range of climatic and river level conditions
  - Data collection showed how dynamic the structure movement is under changing conditions



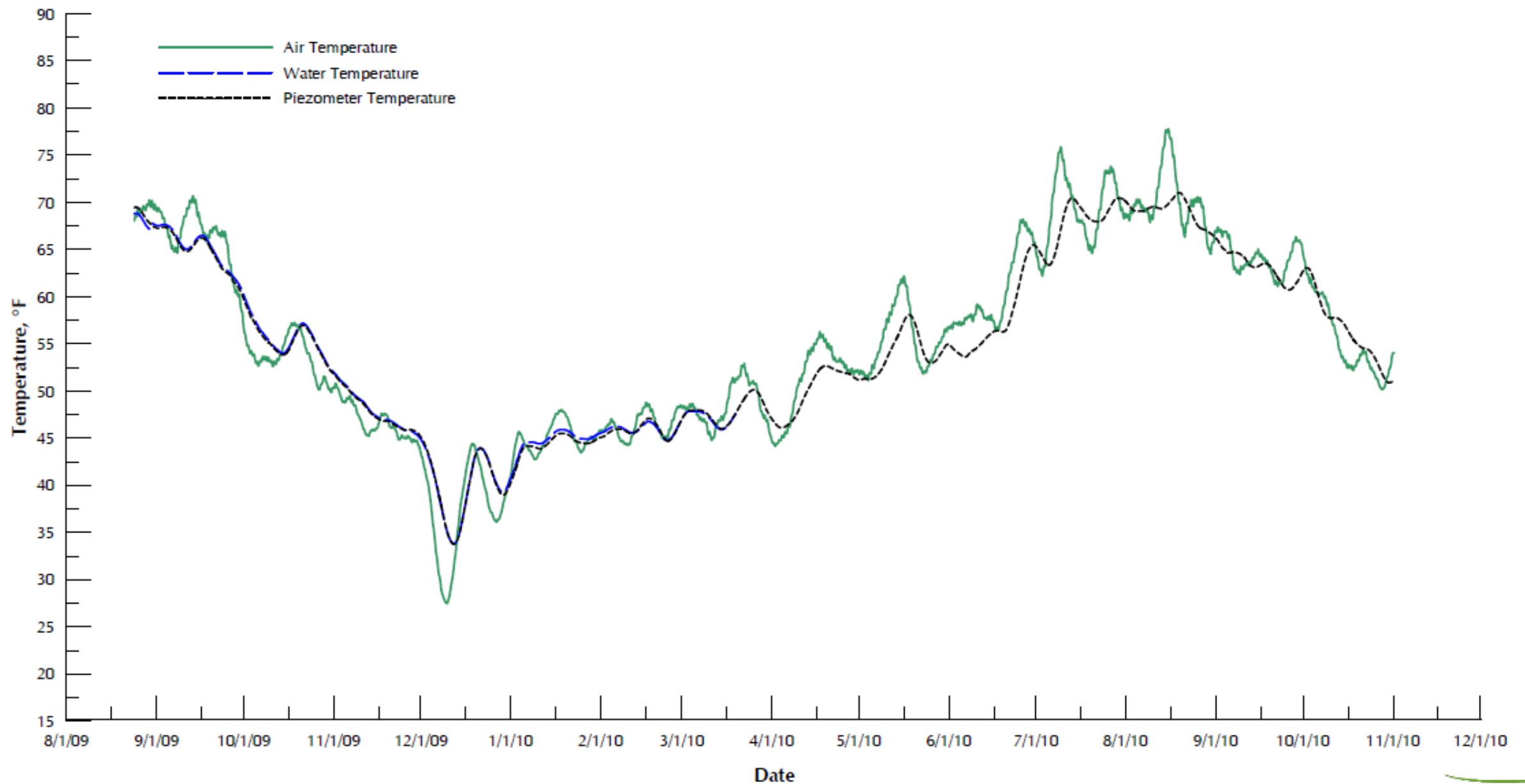


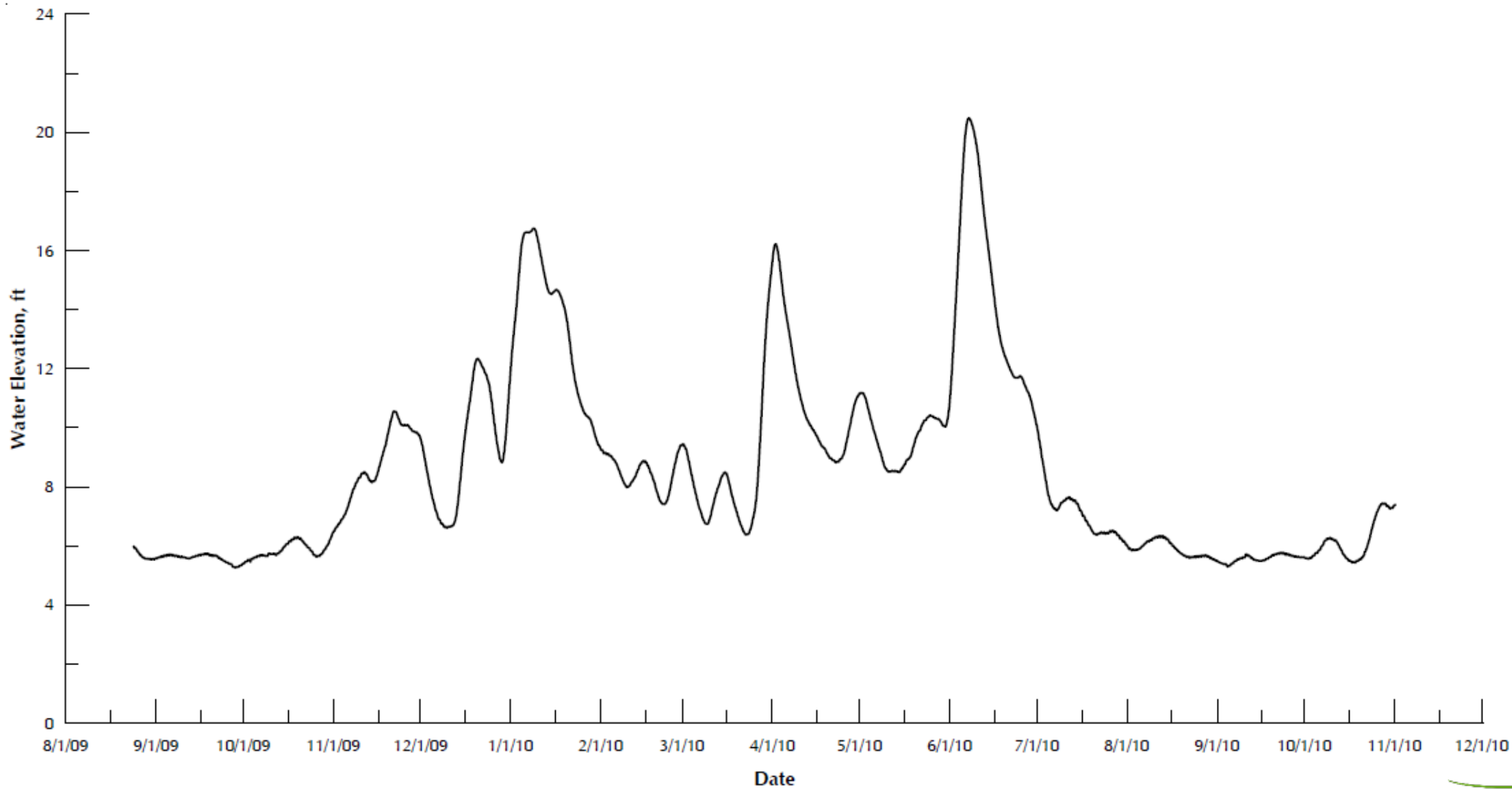




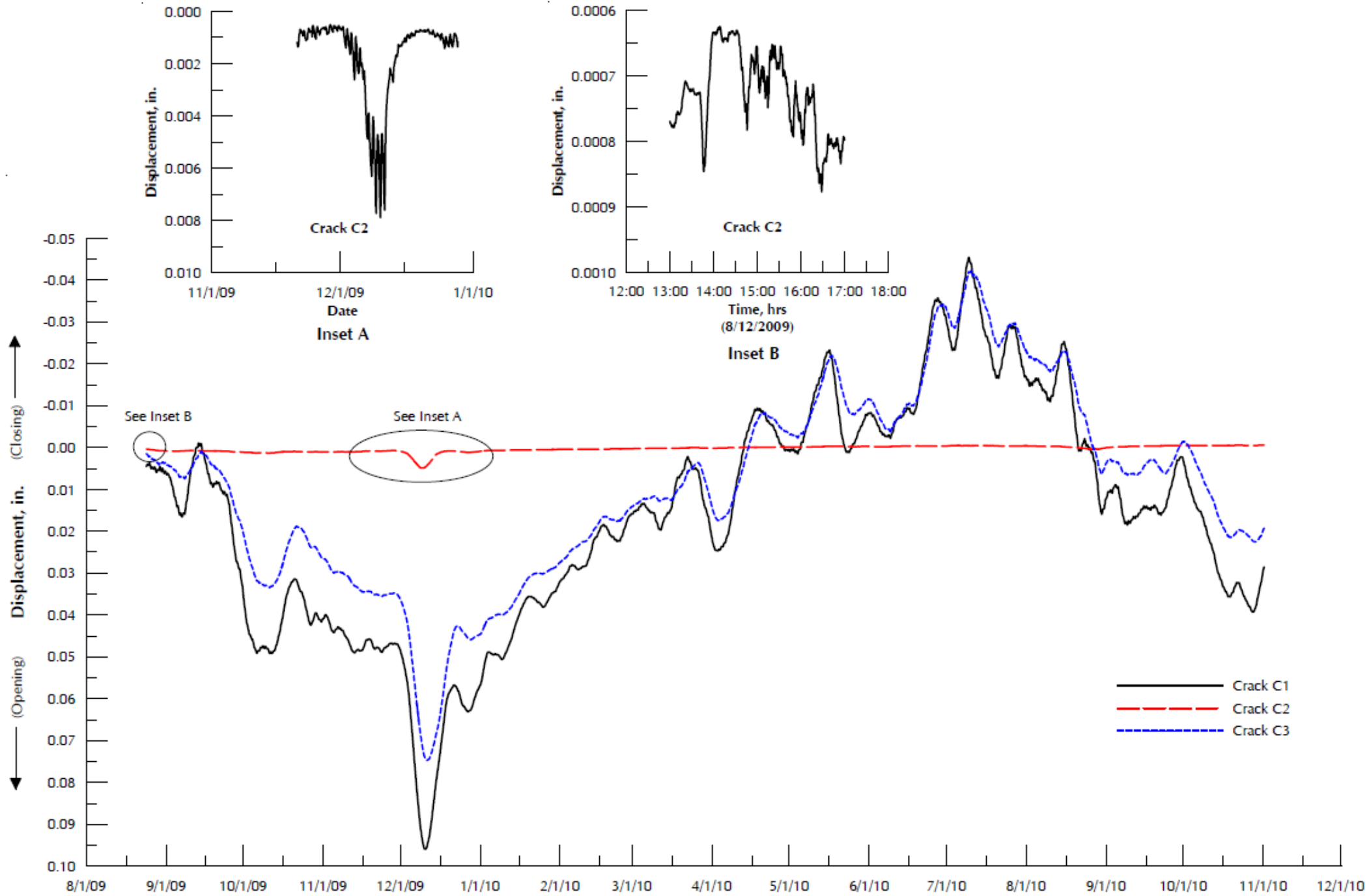




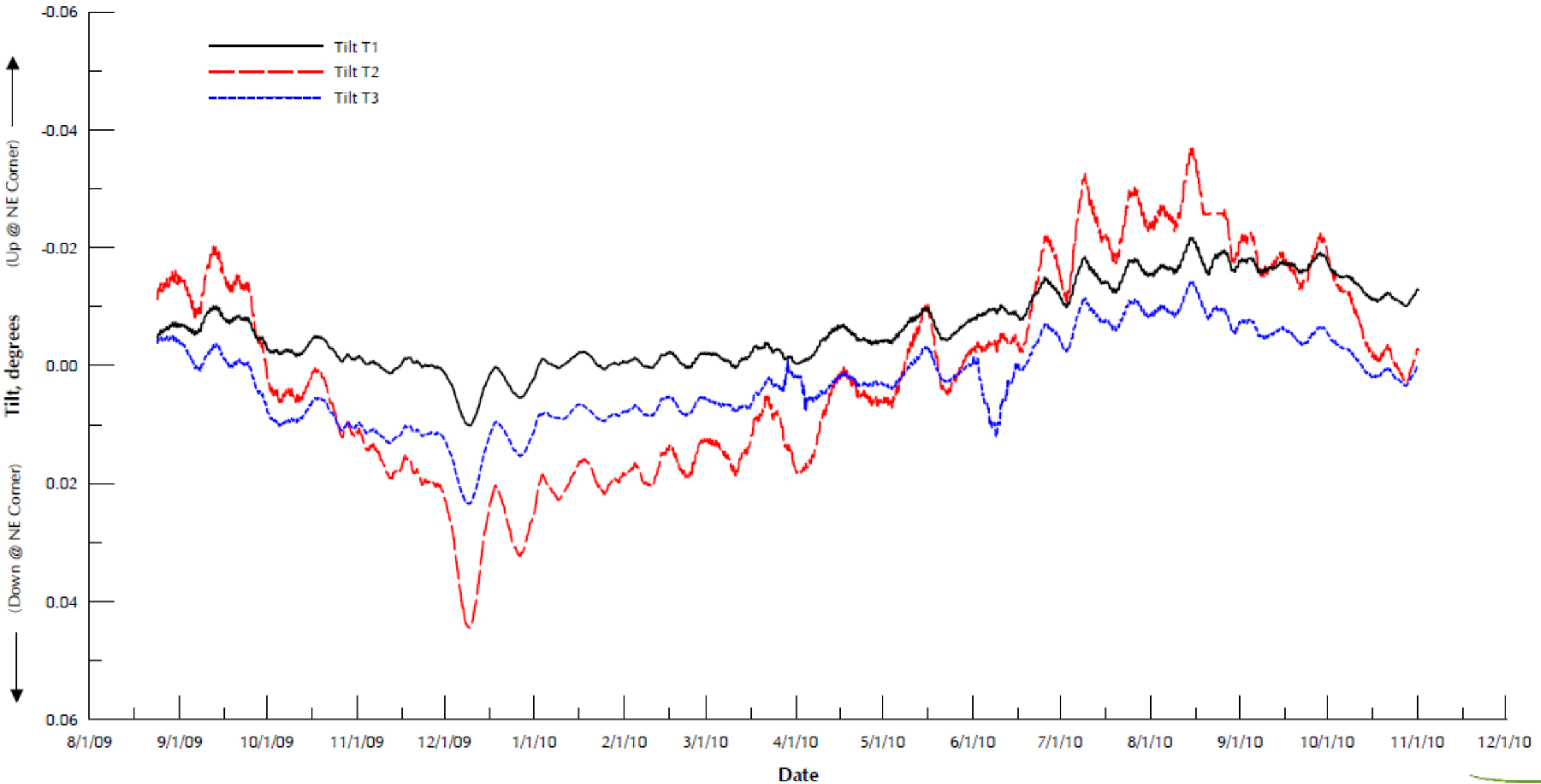








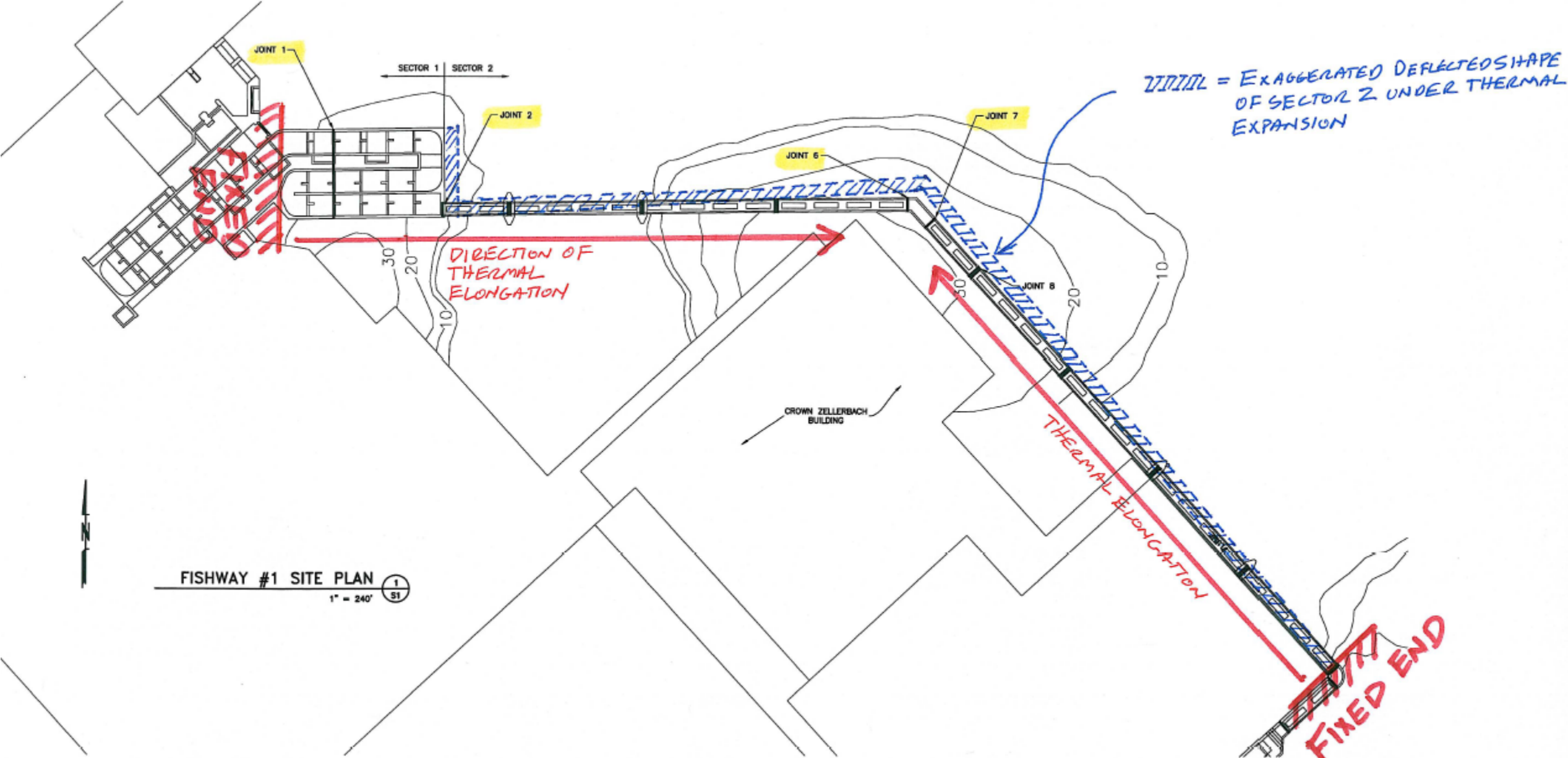






# WILLAMETTE FALLS FISHWAY – Investigation Conclusions

- Foundation Undermining
  - Additional armoring required to protect from scour
  - Installation of additional gravity support elements
- Thermal Actions Mitigation
  - Continued expansion of joint 1 caused by “fixed” ends of fishway structure
  - Lack of return force caused permanent deflections
  - Compression from thermal forces causing significant stresses in the structure and damage



FISHWAY #1 SITE PLAN 1  
51  
1" = 240'



# WILLAMETTE FALLS FISHWAY – Repairs

- Foundation Repairs
  - Emergency installation of gabion baskets
  - Installation of grouted pin piles at joint 6/7
  - Repair of damaged joints and leak repairs
  - Encasement of foundation repairs
- Thermal Actions Mitigation
  - Releasing joints at key locations to allow for thermal expansion
  - Installation of pre-tensioned thermal force return system





















































