collaboration strategies in the planning and operation of mine tailings facilities

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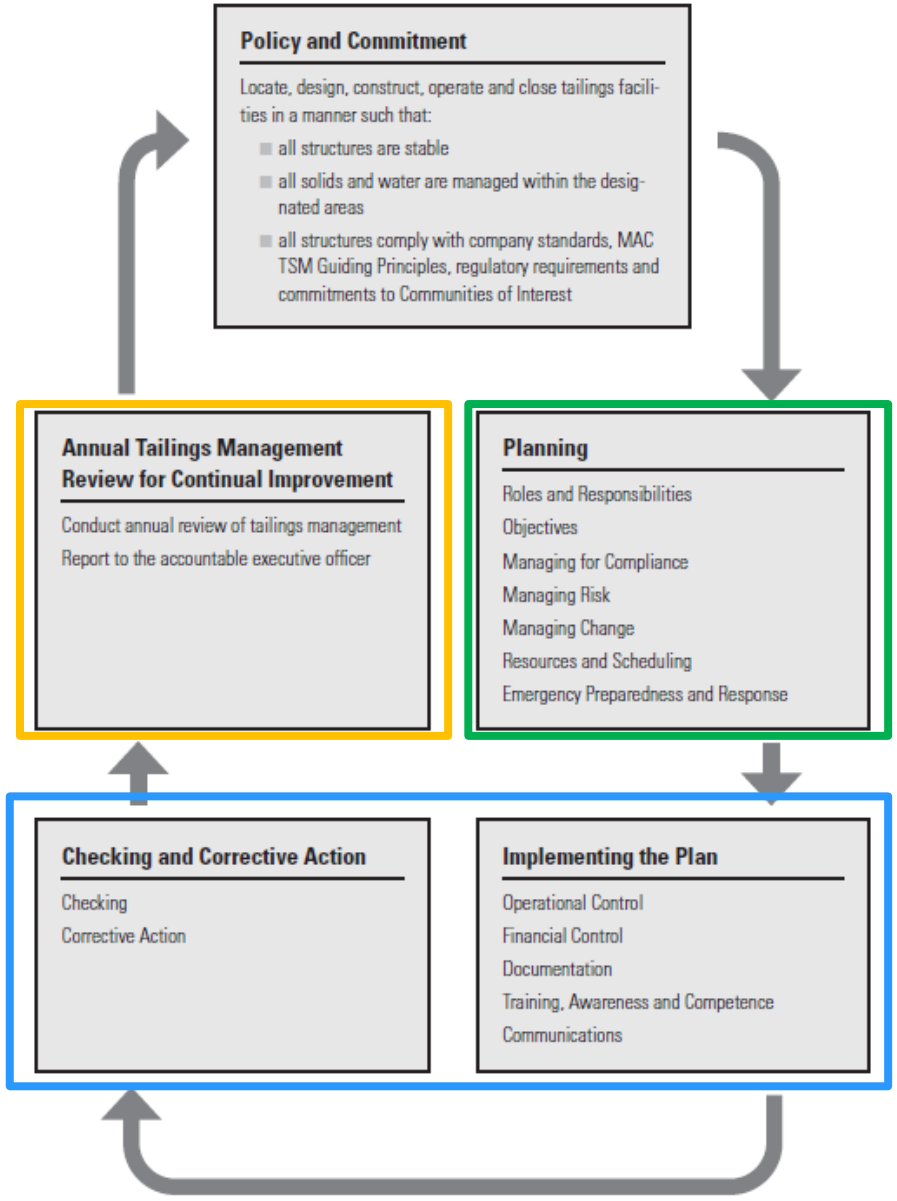
define groups

- engineering: budgets, risk, regulatory
- operations: daily activities, grading, moving lines
- strategies to improve communication and planning
- in order to avoid…

overview with MAC OMS Framework

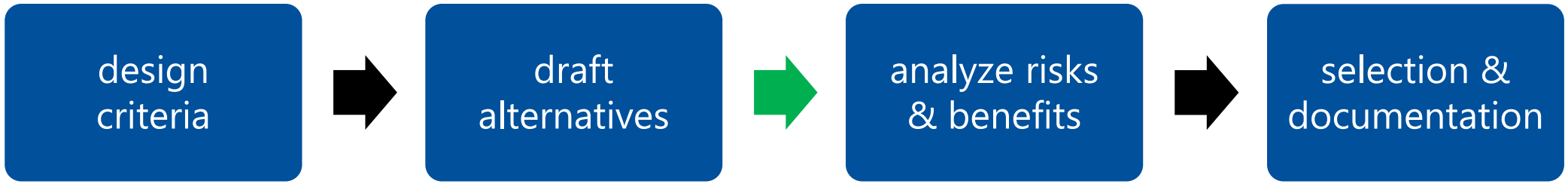
1. operations planning involvement
2. action items short term
   - discuss challenges/benefits
3. effective staff trainings
4. annual progress review meeting
   - conclusions and questions



Elements of the Tailings Management Framework
Source: Mining Association of Canada

planning operator involvement

- long-term planning (typically engineering driven)
- it's important to involve operations in the process
  - develop and analyze alternatives stage
- this develops "buy in" to a common goal and forms a team

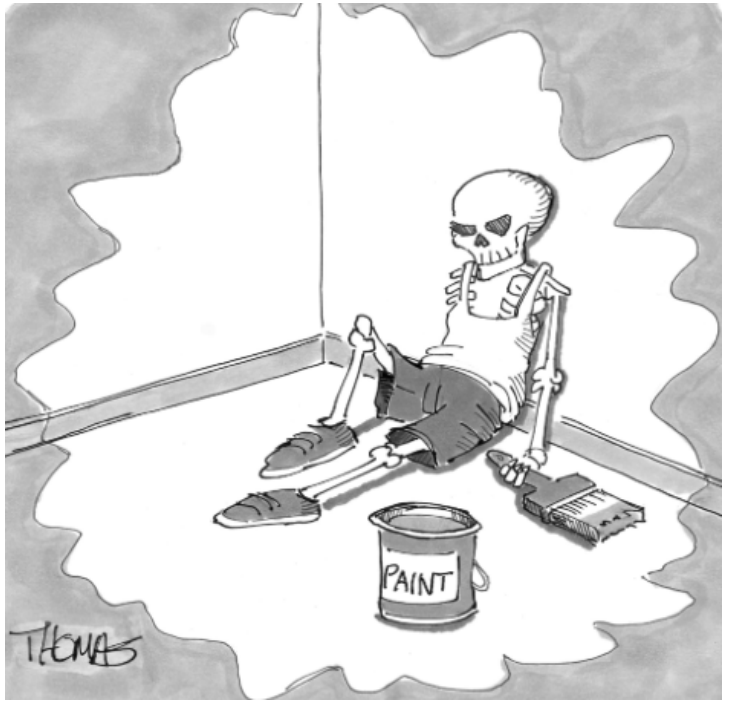


contingency planning

- contingency planning if issues occur
  - short-term: low-risk place to deposit immediately
  - long-term: identify risks in grading plan
    - draft alternate plan

don't

turn into



implementing the plan

- tailings construction unique challenges
  - materials, sites, weather, crews, observation
  - operations experience
- project delivery methods
  - other than design-construct

short-term planning

- how do we get to long-term plan?
- engineering more coaching role
  - help establish action items (goals)
  - work with operations to achieve

existing conditions

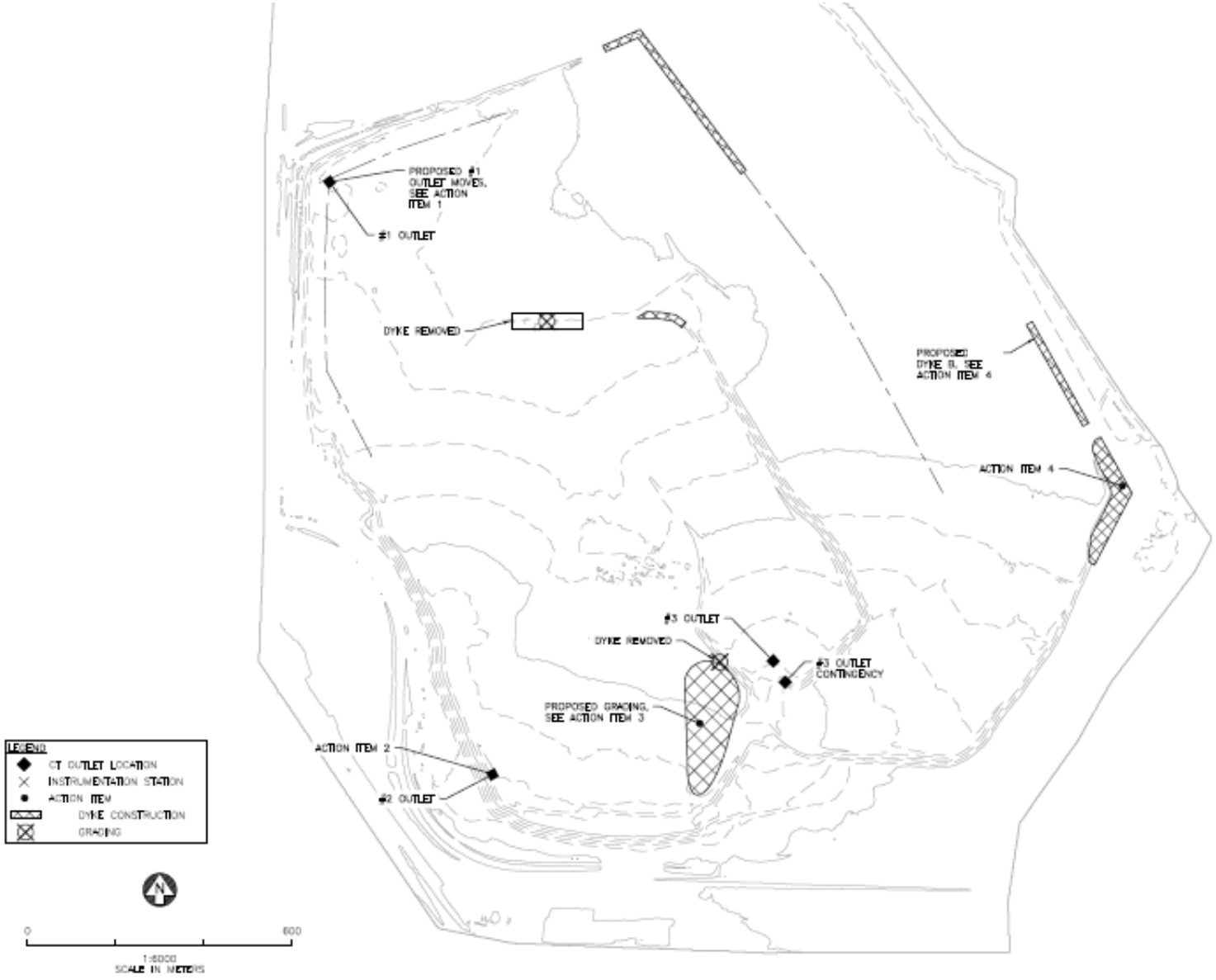
long-term plan

or

utilizing action items

- level of detail to describe (what, where, **why?**)
  - single drawing
  - a few sentences per action
- regular progress meetings (minimum quarterly)
  - in-field review

action items plan example



NOTES:

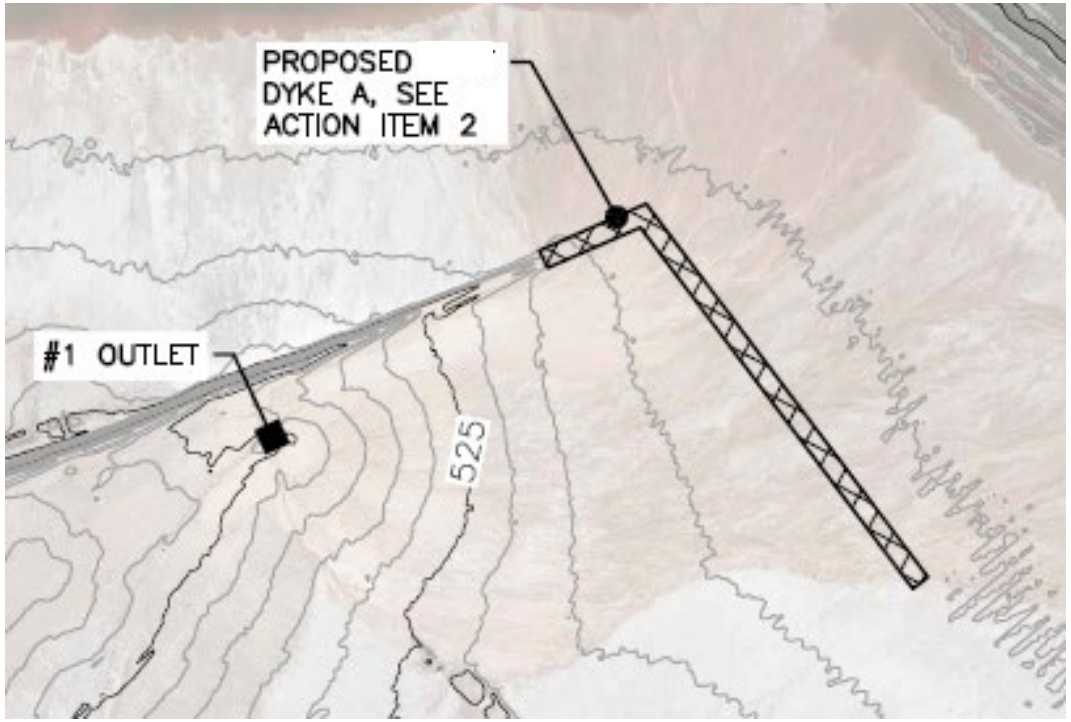
1. ACTION ITEMS ARE NOT LISTED BASED ON THEIR PRIORITY. ACTION ITEMS SHOULD BE COMPLETED IN A SAFE AND EFFICIENT MANNER AS DETERMINED BY THE OPERATORS AND THEIR FOREMAN.

2. THE COARSE TAILINGS PILE OPERATORS AND THEIR FOREMAN SHOULD WORK TO ESTABLISH A PLAN FOR COMPLETING DAILY ACTIVITIES. REGULAR EVALUATIONS OF THE COARSE TAILINGS PILE SHOULD BE PERFORMED TO CHECK THAT CONDITIONS ARE SAFE TO EXECUTE GRADING ACTIVITIES. THE ACTION ITEMS LISTED BELOW SHOULD NOT BE COMPLETED IF ANY UNMITIGATED SAFETY CONCERNS EXIST.

ACTION ITEMS:

ACTION ITEM 1 –

action items example



- continue to construct Tailings Dyke A to the location shown
- construct the dyke southeast toward the south injection well; stakes can be placed by Barr to help guide alignment as required
- the dyke will help direct deposited tailings from flowing into the east pond

benefits

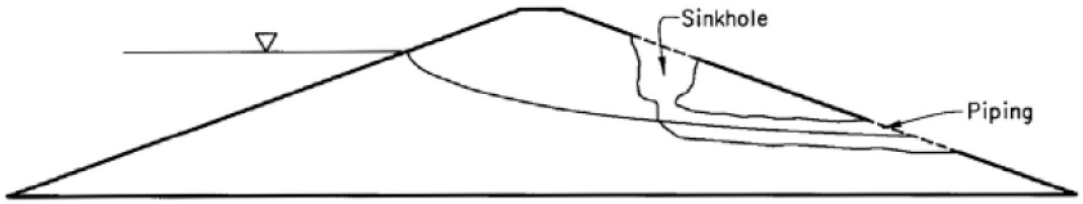
- operations flexibility to make adjustments
- easier document to reference and read
- easily updated compared plans/memos
  - other docs can supplement when needed
  - not intended as MAC OMS manual or site documentation

risks

- approach may not fit every situation
  - style of crew and level of detail
- communication plan and version control
- committed engineering and operations working together
- model of consulting engineer supporting EOR (mine)

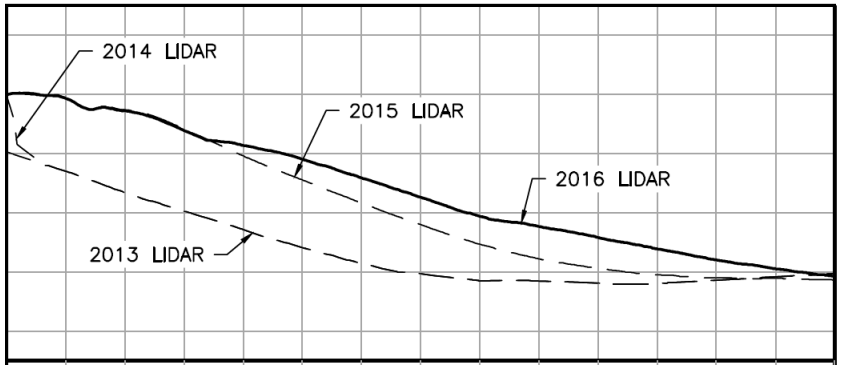
trainings and awareness

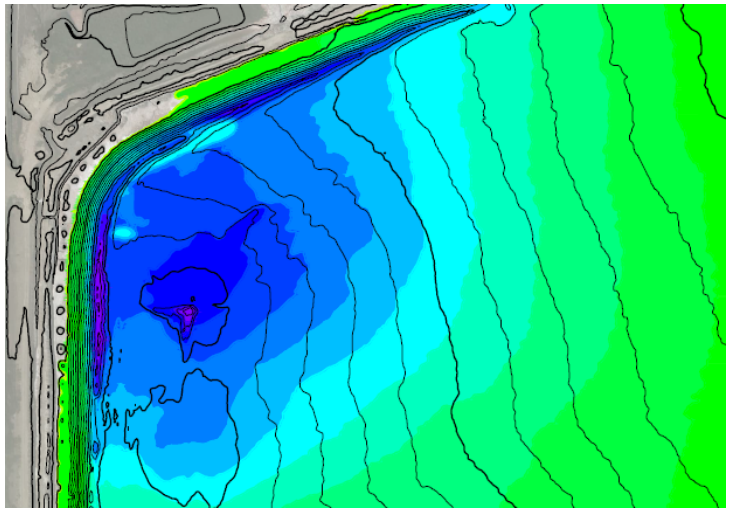
- dyke and tailings pile stability trainings
  - common failure signs
- in-person course with field component
- handouts for future reference
- helpful in identifying issues early



annual tailings management review

- perform annual survey to track progress
  - compare surfaces through years
- get all operations and engineering together
- open discussion of progress
- update action items





conclusions

- involve Engineering and Operations in long-term planning
  - help form a team toward common goal
  - draft contingency plans to address risks
- consider using action item short term plans
  - simple document operations to use
  - flexible and easy to update

conclusions

- address short-term action items risks
  - establish a communication plan
  - review in field and update regularly
- provide supplemental trainings
- hold annual review meetings

final

- questions and discussion