Knight Piésold
CONSULTING

Memorandum

Rutherford Kayak Park

Date:	28 October 2005	Our Ref:	VA103-00002/8-A.01
To:	Richard Blanchet CC: Paul Wearmouth	Cont.#:	V5-1107
From:	Sam Mottram		
Re:	Rutherford Kayak Park – Safety Modifications		

Dear Richard,

As requested, below is a summary of the Rutherford Kayak Parks performance and recommended safety modifications.

1. Start Pool

a. Start Pool - Performance

Without obstacles in the downstream anchor pads, the start pool is too shallow and therefore the velocities are too high. The safety risk associated with the recirculation at the twin port tailrace outlet will also be reduced with higher water levels in the start pool.

b. Start Pool - Modifications

- Place lock blocks on first anchor pad to increase pool depth and reduce velocity.
- Run wet test to see if this improves safety of twin port recircultation.

2. Squamish Canyon

a. Squamish Canyon - Performance

The Squamish Canyon performs very similar to the model. At higher flow rates during model testing the water also backed up, as it does in the prototype. Having a few calm areas in the course is good for kayaker safety.

b. Squamish Canyon - Modifications

- At the exit ramp of the feature, fill in large depression to reduce size of hydraulic jump.

3. V-Box Wave

a. V-Box Wave - Performance

The hydraulic jump forms within the confines of the vertical walls of the ramp. During model testing the jump formed about 3m further downstream in open water. The depression in the grouted riprap downstream of the ramp is deeper in the prototype than was modelled.

b. V-Box Wave - Modifications

Force the hydraulic jump to form further downstream in open water. This will be achieved by:

- Filling in the depression at the toe of the ramp.
- Extending the ramp.
- Smooth out rocky barrier walls at bottom of ramp.

4. Vancouver Wave

a. Vancouver Wave - Performance

The hydraulic jump forms within the confines of the vertical walls of the ramp. During model testing the jump formed about 3m further downstream in open water. The depression in the grouted riprap downstream of the ramp is deeper in the prototype than was modelled. The leading edge of the baffle wall is also a safety concern at higher flows.

b. Vancouver Wave - Modifications

Force the hydraulic jump to form further downstream in open water. This will be achieved by:

- Filling in the depression at the toe of the ramp.
- Extending the ramp.
- Smooth out upstream face of baffle wall.

5. Vancouver Canyon

a. Vancouver Canyon - Performance

The Vancouver Canyon performs very similar to the model.

b. Vancouver Canyon - Modifications

- Minor grouting required on right bank at top of feature run.
- Add lock blocks to downstream anchor pad to increase flow depth and reduce velocity.

6. Tumble Weed and Chicken Run

a. Tumble Weed and Chicken Run - Performance

Perform as planned, except at higher flows where high velocity water impacts directly into the headwall of the Tumbleweed feature.

b. Tumble Weed - Modifications

- Adding lock blocks to the anchor pads upstream of the Tumble Weed feature may slow the water down enough to solve the problem.
- If the lock blocks do not solve the problem, then add grouted rock boulder nose on right bank to divert water away from headwall (As proposed by REC).

7. Kayak Pool

a. Kayak Pool - Performance

Pool performs as planned, except is a little shallow. The boulder weir/sill that was placed in the main channel directly downstream of the entry to the kayak pool, which washed away at higher flows, needs to be grouted in place.

b. Kayak Pool - Modifications

- Add grouted boulder ramp/sill (0.5m high) in main channel directly downstream of kayak pool entry. This will increase the water depth and slow down the velocity allowing easier entry for kayakers/swimmers into the Kayak Pool.

8. Twin Falls

a. Twin Falls - Performance

Twin Falls main purpose is to act as a barrier/deterrent to fish migrating into the kayak park during operation. This is a DFO requirement. The falls are navigable for experienced paddlers.

b. Twin Falls - Modifications

- As stated above, this vertical drop is required to satisfy DFO requirements.
- The Twin Falls feature is navigable for expert kayakers (Class III – IV).
- All non-expert kayakers should end their run in the Kayak Pool. Signs should be posted along the course to this effect.

9. Channel Grouting

a. Channel Grouting

The vast majority of the grouted rip rap channel has grout of sufficient thickness to properly secure the rip rap boulders. The surface roughness of the grout could be either an advantage or disadvantage, depending on how you look at it:

- The rough surface makes it easier to climb out of the course, which has steep sides. It is less slick, especially when wet, and therefore safer for spectators and kayakers climbing out of the course.
- However, if you do slide along the grouted surface while paddling (i.e. involuntary swim) it would lead to skin abrasion. This is cold Class III – IV water and all kayakers should be wearing appropriate protective clothing and equipment.

10. Movable Obstacles Design

a. Movable Obstacles Design

As a start, I would recommend using concrete lock blocks with steel posts inserted into the anchor pads on their downstream face to prevent sliding. These obstacles are heavy and will require machinery to move. If WKABC can find a sponsor, I would recommend they purchase the duckboards and movable obstacles from Hydrostadium (www.hydrostadium.com). This is the best system that I am aware of, but it is very expensive and vandalism and theft may be a problem for a non-fenced facility.

If WKABC can not raise the money to install the Hydrostadium movable obstacles, I would recommend they use obstacles similar to those used at the Dickerson Whitewater Course (Maryland – 35 miles from Washington D.C.). These are large concrete "boulders" that could be designed to slot into the existing Rutherford Anchor pads. They will require machinery to move them around, but the advantage of this is that they will not be vandalized or stolen. (Google – "Dickerson Whitewater Course" for details of construction and installation).

11. Other Recommendations (WKABC Scope)

- Signs should be placed at all entry points (Car and Pedestrian) to warn that this is a Class III – IV facility for WKABC members only. The other option is to fence the entire facility, but this will take away from its appeal and be an ongoing maintenance issue for WKABC.
- Refer to Design Basis and Operating Manual for operating guidelines and recommended waivers to be used by WKABC.
- Obstacles should be placed in anchor pads throughout the course. This will reduce the velocity and increase the depth, making it safer for all.

12. Final Comment

Even with the proposed safety improvements suggested above, this facility is still designed as a Class III – IV Waterwater Kayak Park and should be treated as such by WKABC.