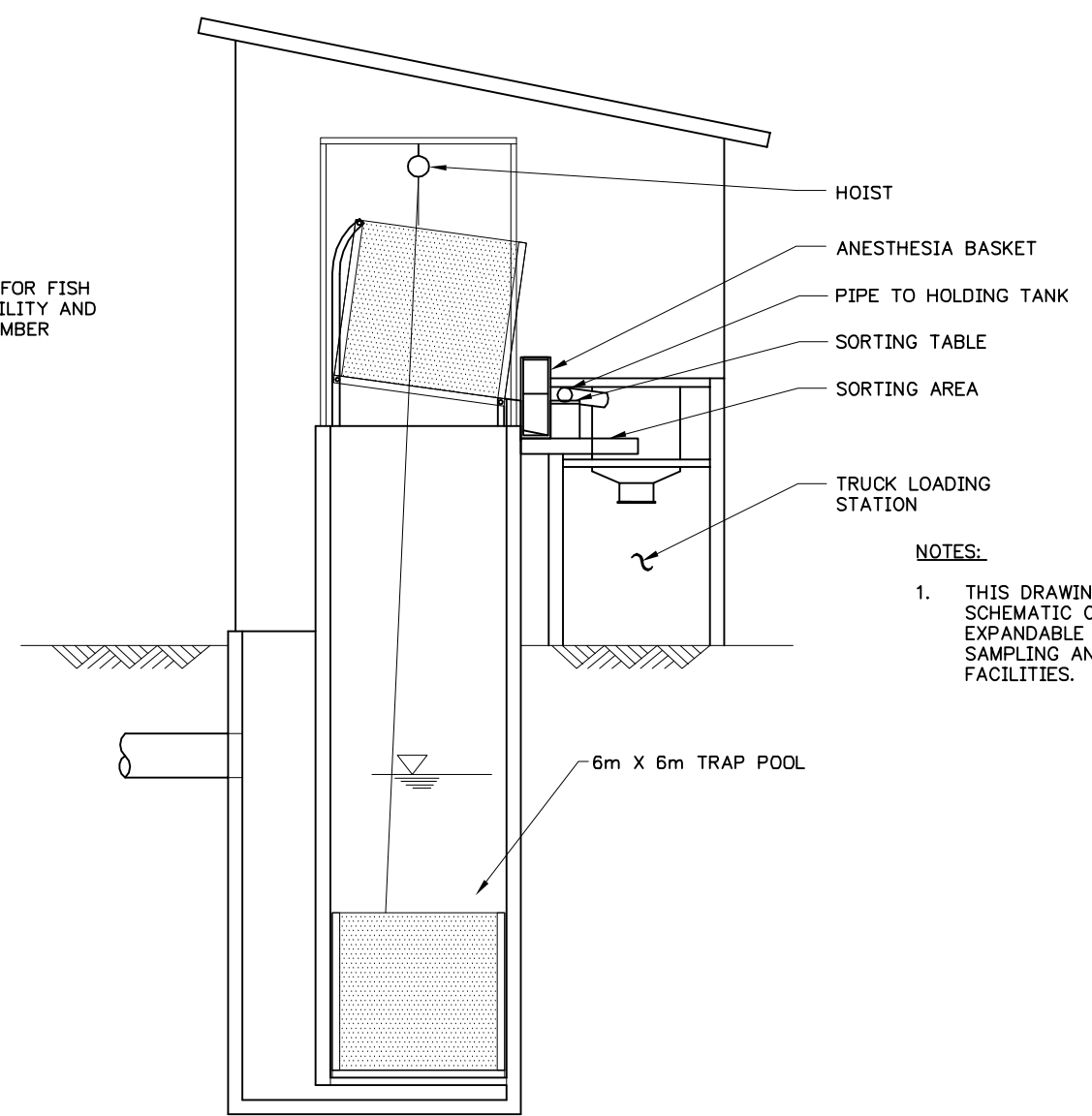
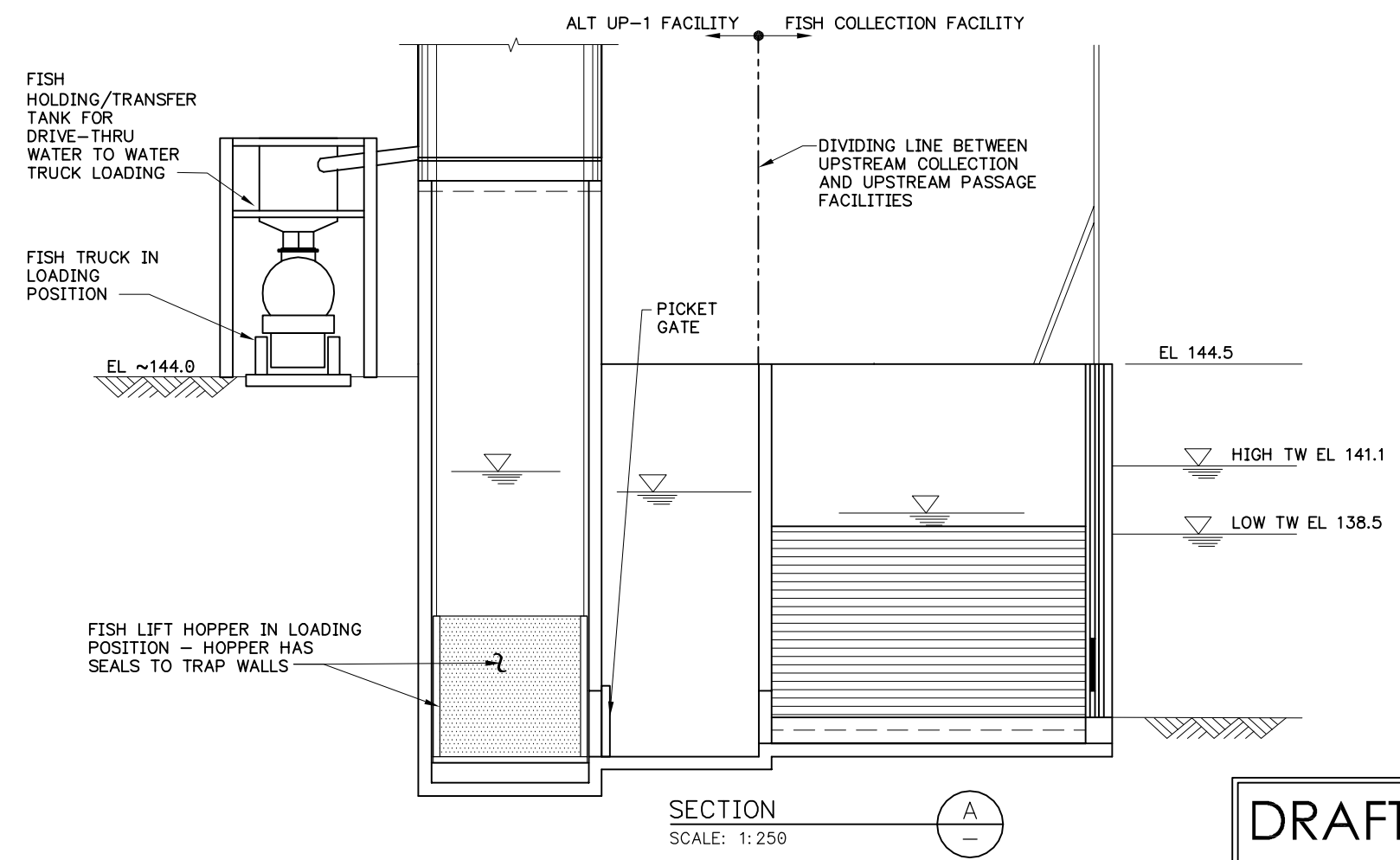
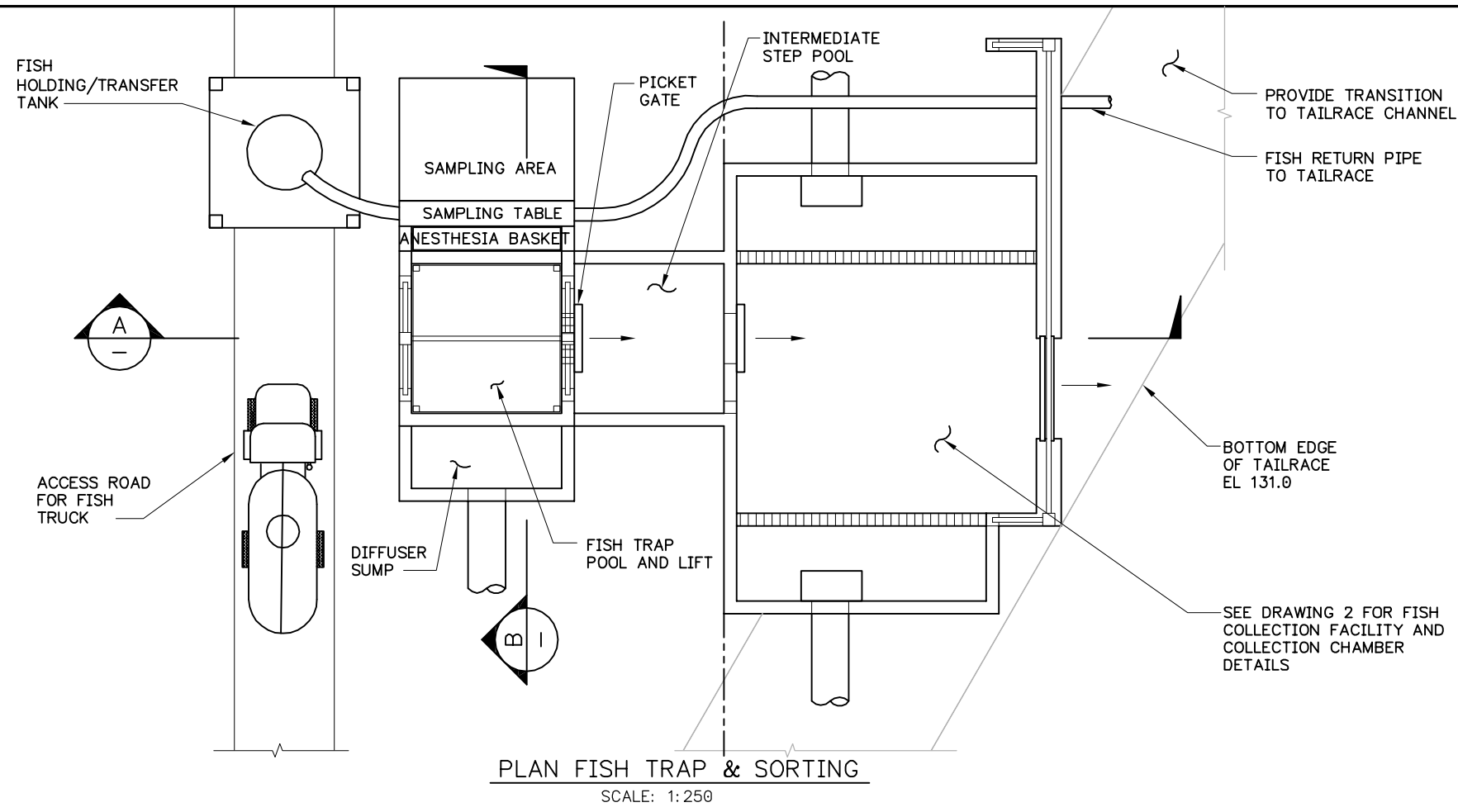
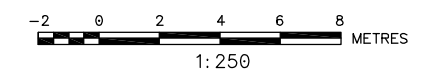


\\manishared\project\1895 KeeYask FP Study\Drawings\UPSTREAM PASSAGE PACKAGES\WORKING DRAWINGS\DWG 09 Upstream Collection Chamber - Sheet 2 of 2.dwg, 3/19/2012 10:01:33 AM



- NOTES:**
1. THIS DRAWING SHOWS A SCHEMATIC CONCEPT FOR AN EXPANDABLE FISH TRAP WITH SAMPLING AND TRUCK LOADING FACILITIES.



DISTANCES AND ELEVATIONS ARE IN METRES

DRAFT FOR REVIEW AND DISCUSSION ONLY

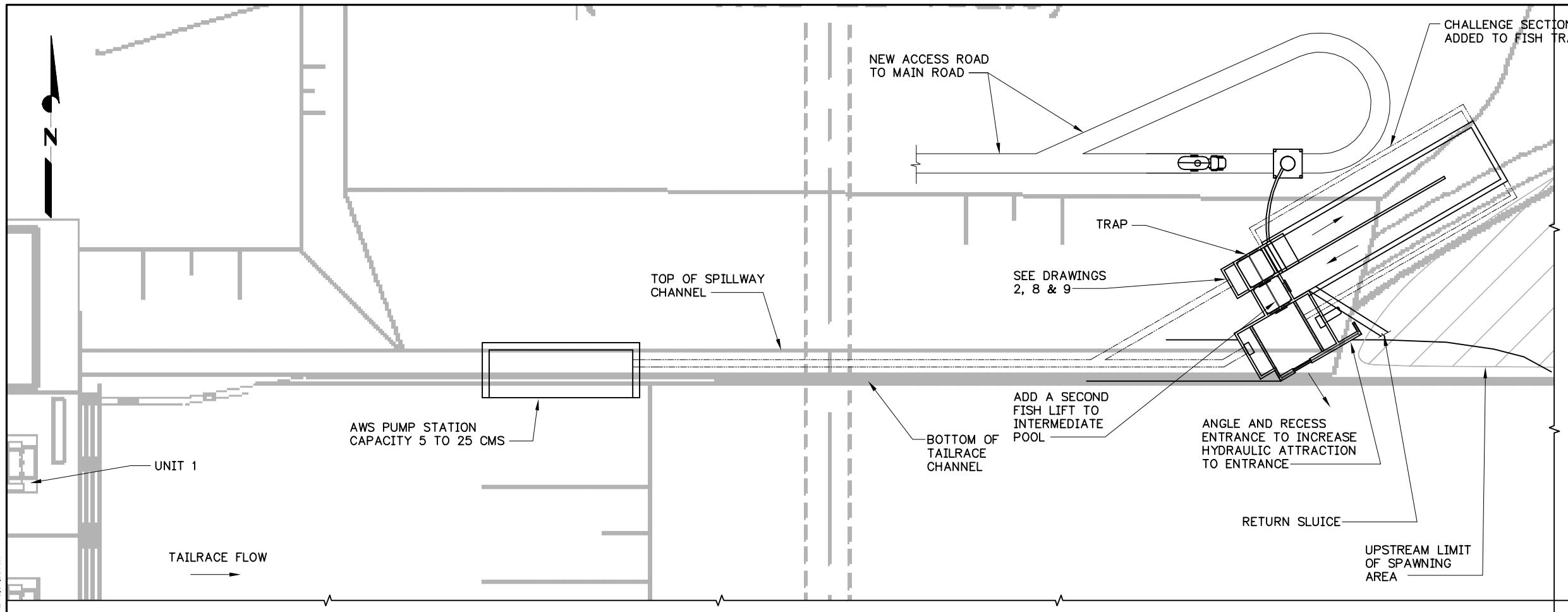
Resource Consultants, Inc.
REDMOND, WA.

DATE: 3/16/2012

MANITOBA HYDRO
KEEYASK FISH PASSAGE FACILITIES STUDY
UPSTREAM PASSAGE - ALT UP-1
TRAP & TRANSPORT FROM COLLECTOR
SHEET 2 OF 2

DWG 9

I:\mashared\project\1895 Keyask FP Study\Drawings\UPSTREAM PASSAGE PACKAGES\WORKING DRAWINGS\DWG 10 Upstream Passage Alt UP-2 - Sheet 1 of 2.dwg, 3/19/2012 10:01:38 AM



UPSTREAM PASSAGE

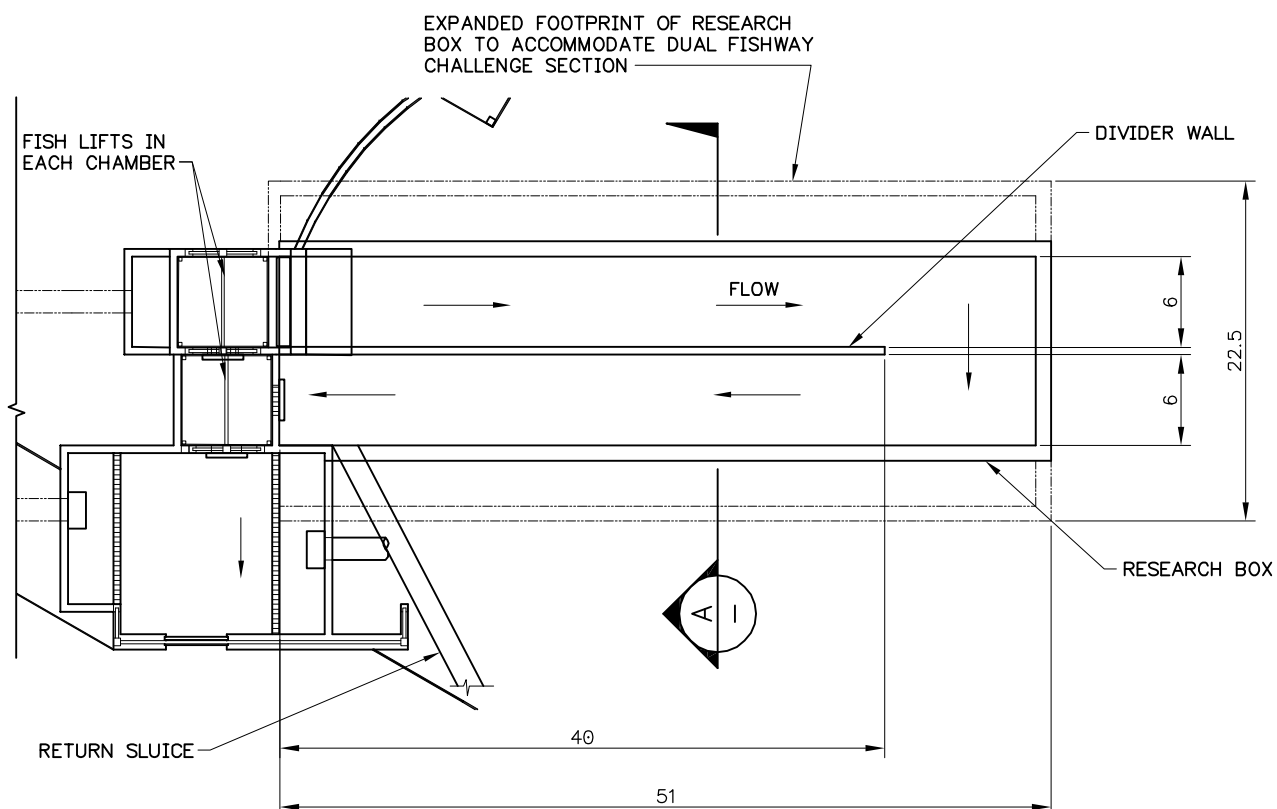
ALT UP-2: TRAP & TRANSPORT

NOTES:

1. CONCEPT IS TO PROVIDE ADJUSTABLE BOX TO ALLOW FOR MULTIPLE CHALLENGE FISHWAY CONFIGURATIONS, NEED TO FURTHER DEVELOP DESIRED TESTS.
2. POSSIBLE FISHWAY TESTS CONFIGURATIONS SHOW ON DRAWING 11.
3. A SECOND FISH LIFT IS REQUIRED IN THE INTERMEDIATE POOL FOR THIS CONFIGURATION.

KEY PLAN: ALT UP-2 TRAP & TRANSPORT WITH CHALLENGE SECTION

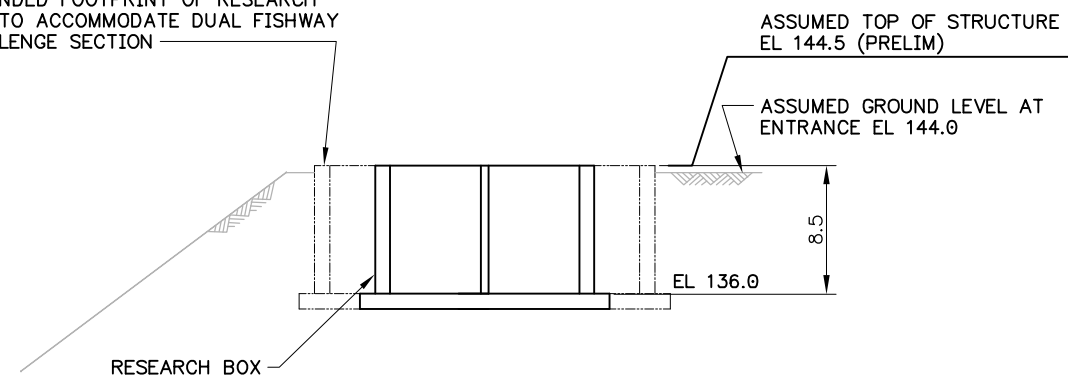
SCALE: 1:1000



CHALLENGE SECTION - RESEARCH BOX PLAN

SCALE: 1:500

EXPANDED FOOTPRINT OF RESEARCH BOX TO ACCOMMODATE DUAL FISHWAY CHALLENGE SECTION



CHALLENGE SECTION BOX - SECTION A

SCALE: 1:500

0 5 10 15 20 METRES

1:500

0 10 20 30 40 METRES

1:1000

DISTANCES AND ELEVATIONS ARE IN METRES

DRAFT FOR REVIEW AND DISCUSSION ONLY

Resource Consultants, Inc.
REDMOND, WA.

DATE: 3/16/2012

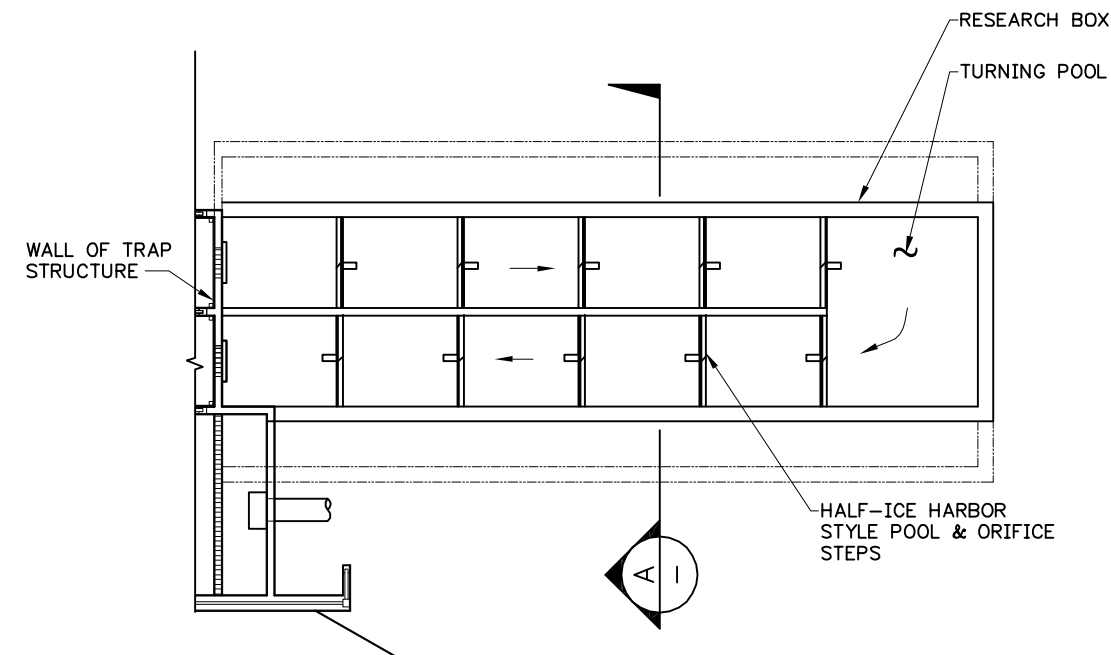
MANITOBA HYDRO
KEYASK FISH PASSAGE FACILITIES STUDY

UPSTREAM PASSAGE - ALT UP-2
TRAP & TRANSPORT WITH CHALLENGE

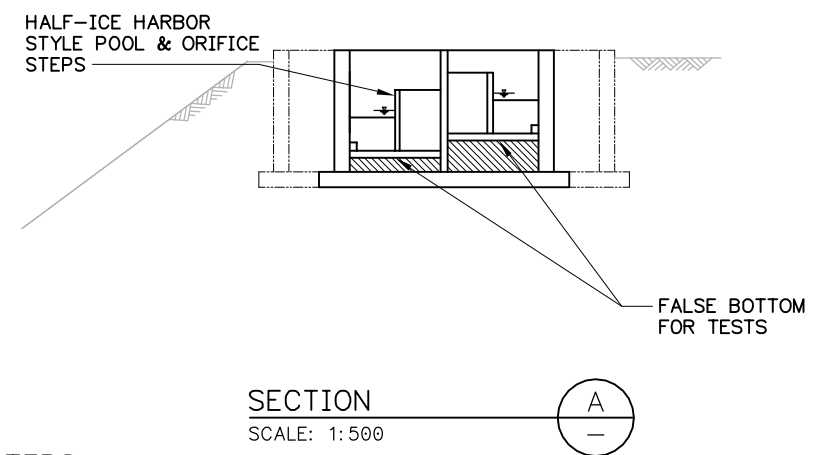
SHEET 1 OF 2

DWG 10

I:\mashared\project\1895 Keeeyask FP Study\Drawings\UPSTREAM PASSAGE PACKAGES\WORKING DRAWINGS\DWG 11 Upstream Passage Alt UP-2 - Sheet 2 of 2.dwg, 3/19/2012 10:01:43 AM



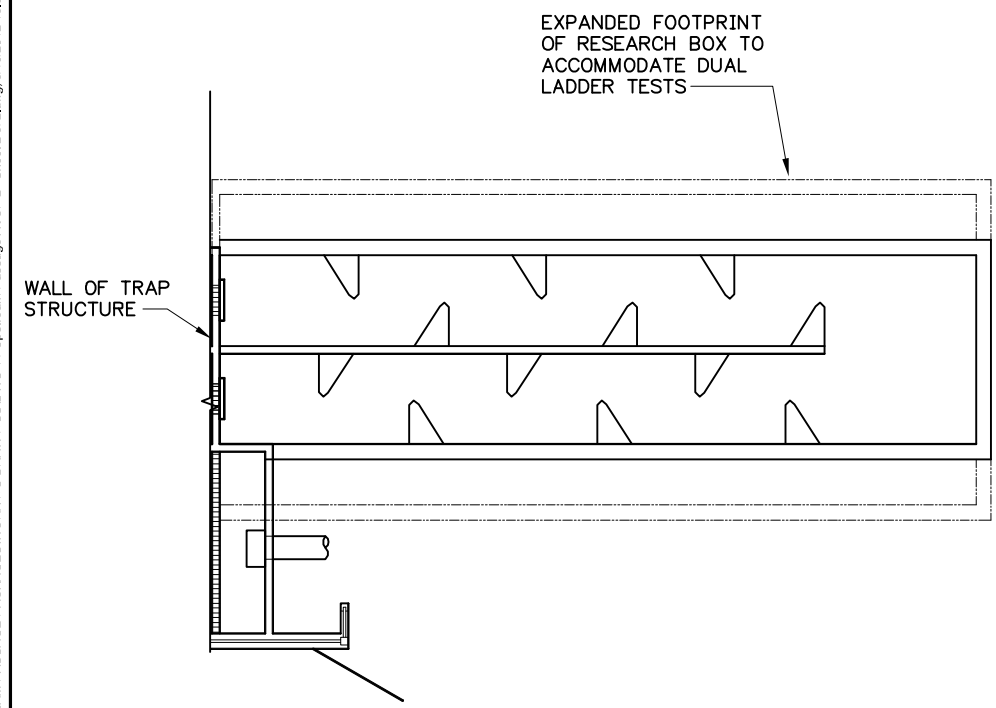
PLAN – ALT CONFIG #1 TO TEST ICE HARBOR STYLE LADDER W/ 9” STEPS
SCALE: 1:500



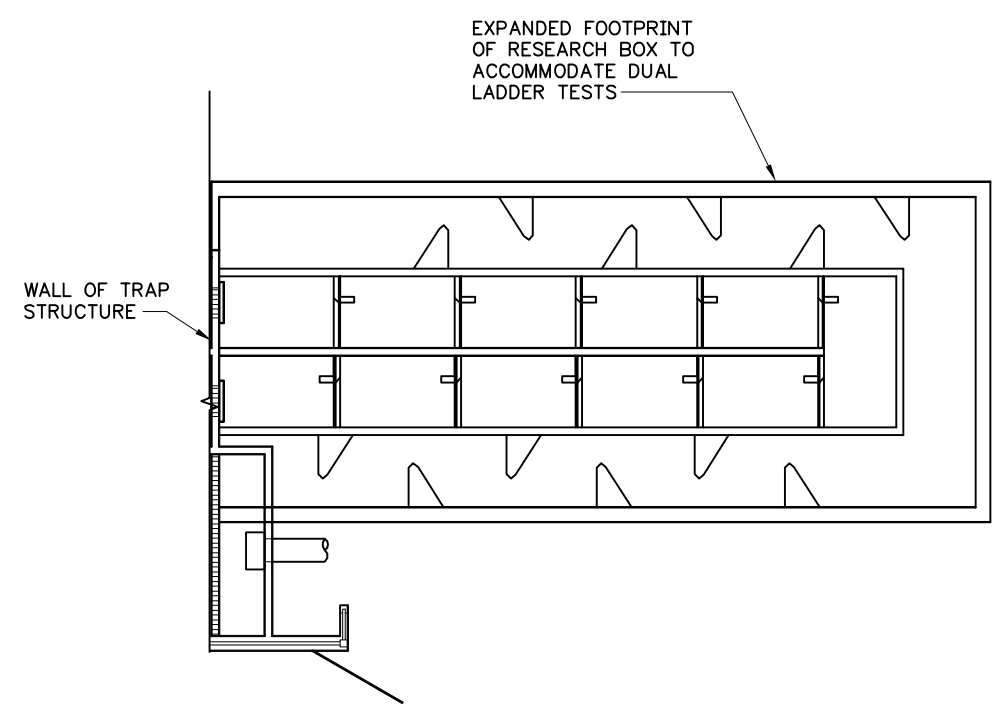
HALF ICE HARBOR FISHWAY
RIVER MILL HALF ICE HARBOR FISH LADDER IN OPERATION



BAFFLED FLUME CONCEPT
INTENT IS TO ILLUSTRATE A FLUME CONCEPT



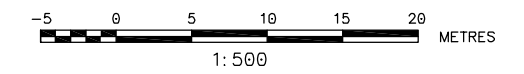
PLAN – ALT CONFIG #2 TO TEST BAFFLED FLUME CONFIGURATION @ 5% SLOPE
SCALE: 1:500



PLAN – ALT CONFIG #3 – DUAL TEST – WEIRS VS FLUME
SCALE: 1:500

NOTES:

1. CONCEPT ILLUSTRATES TWO RESEARCH BOX SIZES TO ACCOMMODATE SINGLE OR DOUBLE LADDER TEST CONFIGURATIONS. RECOMMEND DEVELOPMENT OF A STUDY PLAN PRIOR TO FINAL DESIGN OF RESEARCH BOX.



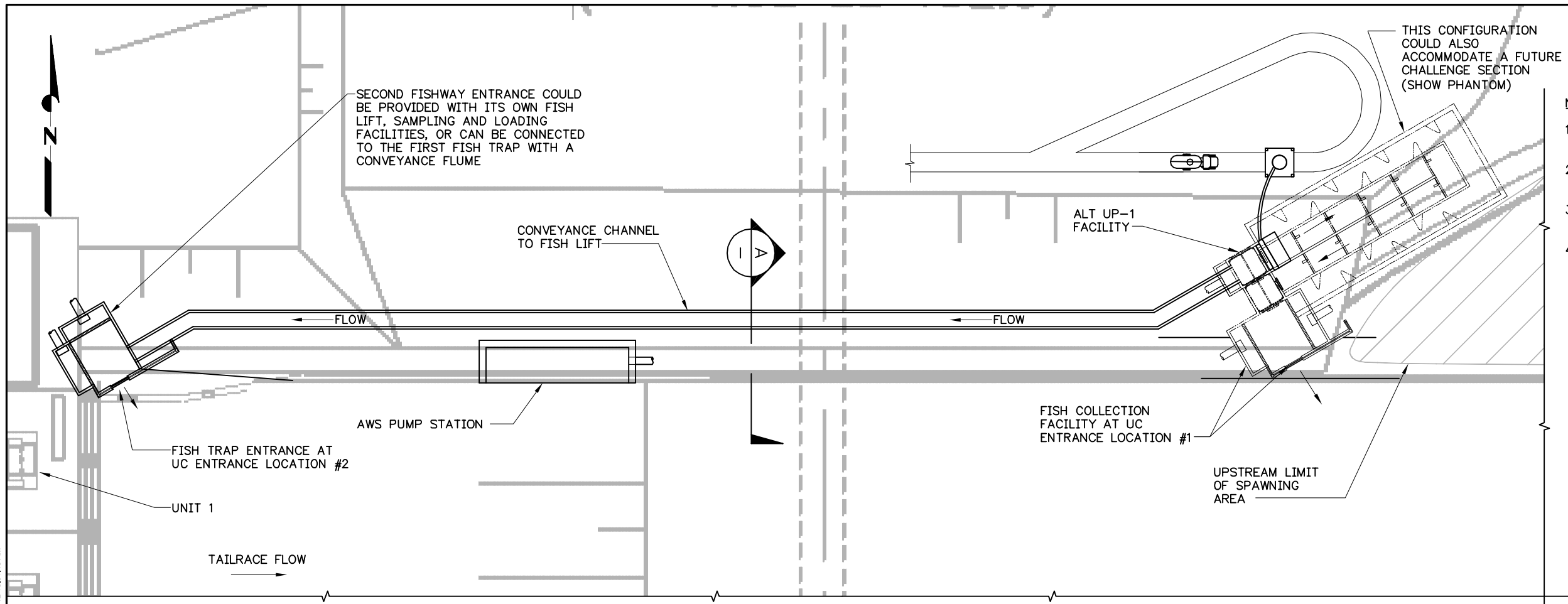
DISTANCES AND ELEVATIONS ARE IN METRES

DRAFT FOR REVIEW AND DISCUSSION ONLY

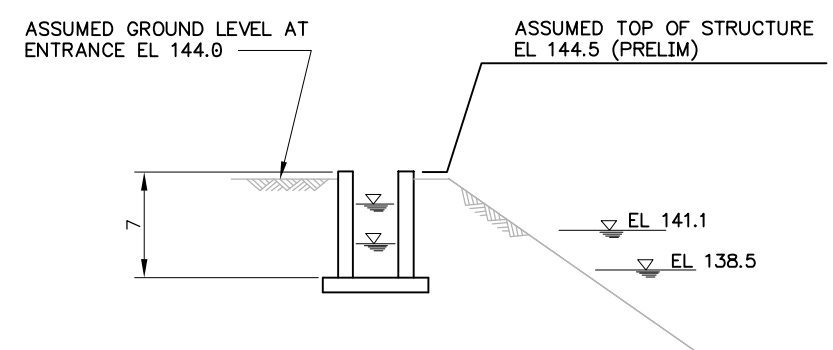
Resource Consultants, Inc.
REDMOND, WA.
DATE: 3/16/2012

MANITOBA HYDRO
KEEYASK FISH PASSAGE FACILITIES STUDY
UPSTREAM PASSAGE – ALT UP-2
TRAP & TRANSPORT WITH CHALLENGE
SHEET 2 OF 2
DWG 11

\\mashared\project\1895\Keyask FP Study\Drawings\UPSTREAM PASSAGE PACKAGES\WORKING DRAWINGS\DWG 12 Upstream Passage Alt UP-2A - Sheet 1 of 2.dwg, 3/19/2012 10:01:48 AM

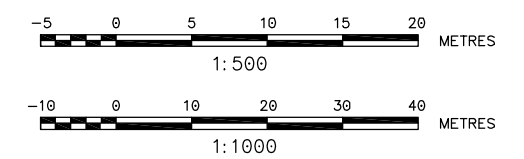


KEY PLAN ALT UP-2 TRAP & TRANSPORT WITH CHALLENGE
SCALE: 1:1000



SCHEMATIC CONCEPT OF CONVEYANCE CHANNEL
SCALE: 1:500

- ### UPSTREAM PASSAGE
- #### ALT UP-2A: TRAP & TRANSPORT
- NOTES:
1. THIS DRAWING ILLUSTRATES HOW THE INITIAL FISH COLLECTION AND TRAP CONCEPT COULD BE EXPANDED.
 2. EXPANSION OPTION 1 WOULD BE TO ADD A SECOND ENTRANCE.
 3. EXPANSION OPTION 2 WOULD BE TO ADD THE CHALLENGE SECTION.
 4. EXPANSION OPTION 3 COULD BE TO CONSTRUCT BOTH EXPANSION OPTIONS OR TO ADD ANOTHER FISHWAY ENTRANCE.



DISTANCES AND ELEVATIONS ARE IN METRES

DRAFT FOR REVIEW AND DISCUSSION ONLY



Resource Consultants, Inc.
REDMOND, WA.

DATE: 3/16/2012

MANITOBA HYDRO
KEEYASK FISH PASSAGE FACILITIES STUDY

UPSTREAM PASSAGE – ALT UP-2A
TRAP & TRANSPORT, FUTURE PHASE CONFIG
SHEET 1 OF 1

DWG 12

UPSTREAM PASSAGE

ALT UP-3: NATURE-LIKE CHANNEL

NOTES:

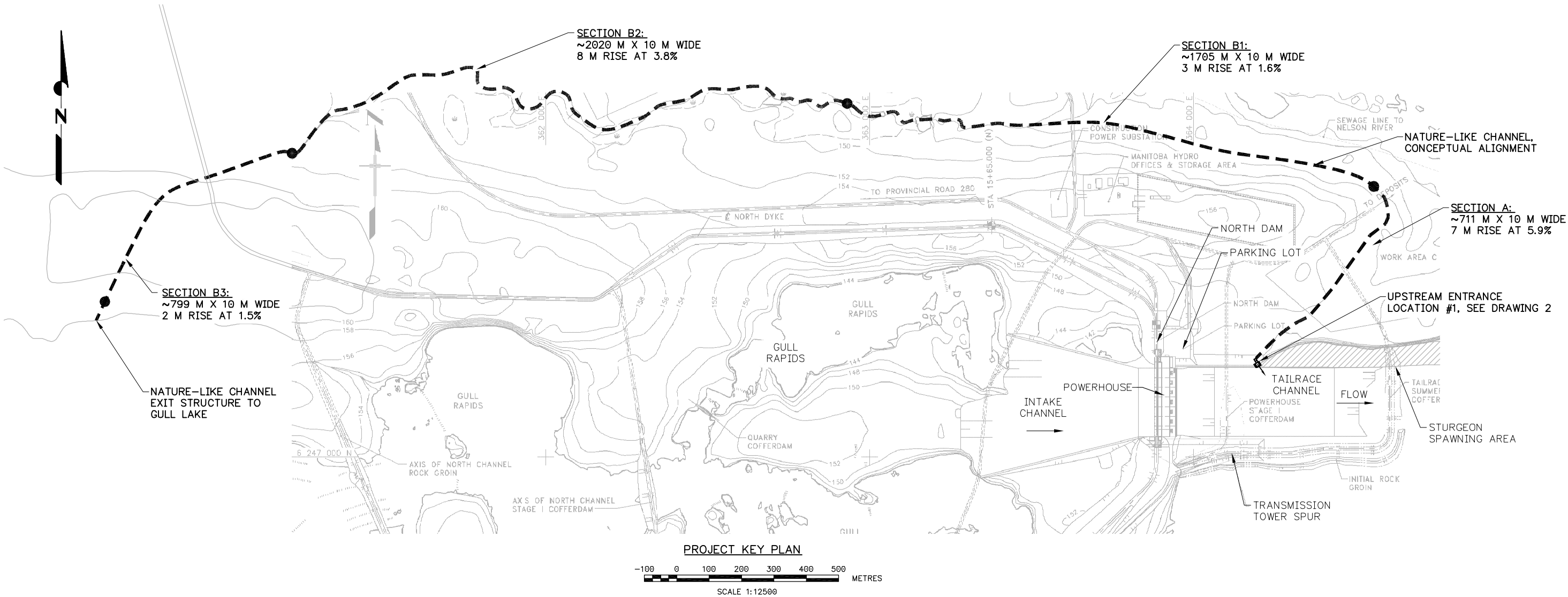
- 1. NATURE-LIKE CHANNEL SHOWN IS BASED ON KGS ACRES STUDY DATED JULY 29, 2009. THIS ALIGNMENT IS A REASONABLE REPRESENTATION FOR THIS ALTERNATIVE.
- 2. SEE TEXT FOR ADDITIONAL INFORMATION AND RECOMMENDATIONS FOR FURTHER STUDY WITH THIS ALTERNATIVE.
- 3. CHANNEL CHARACTERISTICS INCLUDE:
 - 6 TO 12 CMS – CHANNEL FLOW
 - 0.4 TO 0.6 M/S – AVERAGE CHANNEL VELOCITY
 - 10 M – AVERAGE CHANNEL WIDTH
 - 5235 M – OVERALL CHANNEL LENGTH SHOWN
 - 3.8% – AVERAGE SLOPE. NOTE: DESIGN SHOWN VARIES FROM 1.5 TO 5.9%



PHOTO 1
EXAMPLE OF A SWALE
SECTION FOR A NATURE-LIKE
CHANNEL



PHOTO 2
EXAMPLE OF A POOL AND
RIFLE SECTION FOR A
NATURE-LIKE CHANNEL



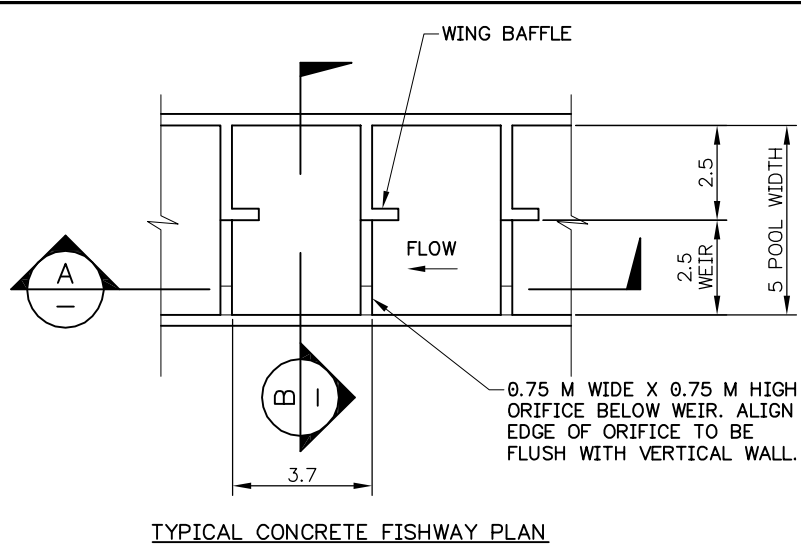
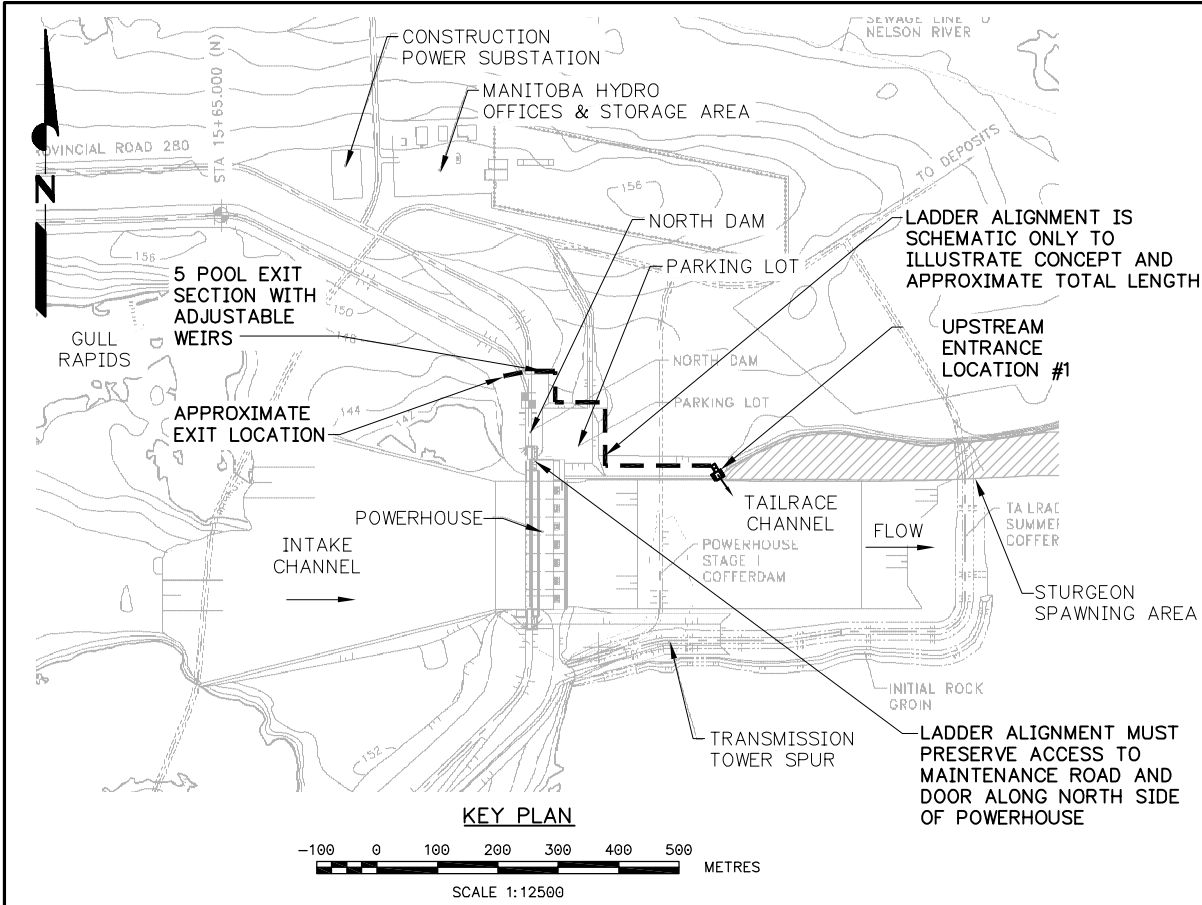
DRAFT FOR REVIEW AND
DISCUSSION ONLY

Resource
Consultants, Inc.
REDMOND, WA.

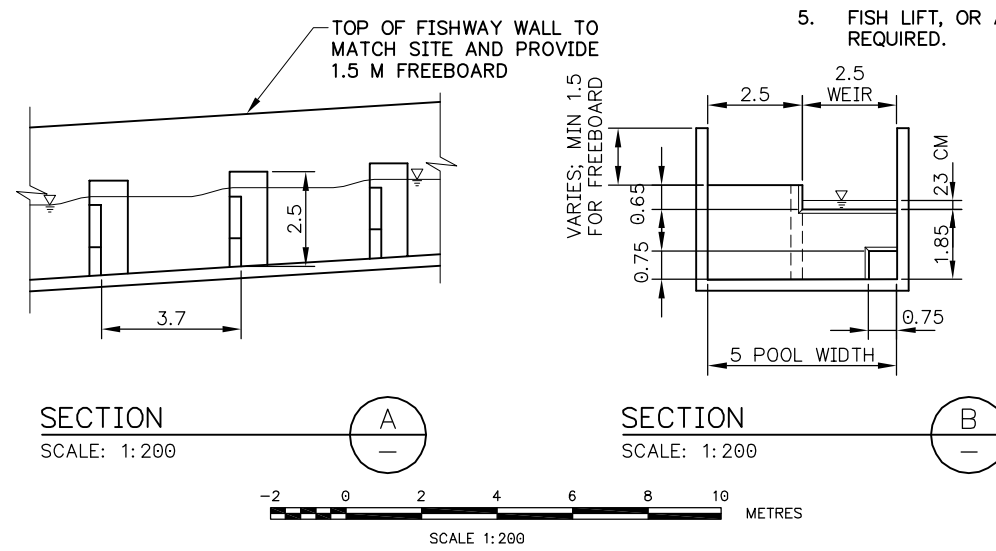
DATE: 3/16/2012

MANITOBA HYDRO
KEEYASK FISH PASSAGE FACILITIES STUDY
UPSTREAM PASSAGE – ALT UP-3
NATURE-LIKE CHANNEL – PLAN & DETAILS
SHEET 1 OF 1

DWG 13



TYPICAL CONCRETE FISHWAY PLAN



SECTION A
SCALE: 1:200

SECTION B
SCALE: 1:200

UPSTREAM PASSAGE

ALT UP-4: CONCRETE FISHWAY

- NOTES:**
1. HALF-ICE HARBOR STYLE POOL-AND-ORIFICE CONCRETE LADDER SHOWN IS BASED ON THE GENERAL LADDER CONFIGURATION FROM THE DALLES EAST FISHWAY, ON THE COLUMBIA RIVER, OWNED AND OPERATED BY THE US ARMY CORPS OF ENGINEERS. THIS LADDER IS KNOWN TO PASS WHITE STURGEON AND OTHER SPECIES SIMILAR TO THOSE AT KEEYASK.
 2. LADDER PROPERTIES CONSIDERED FOR THIS ALTERNATIVE:
 - 23 CM – POOL STEP HEIGHT, DEPTH OF FLOW OVER WEIR
 - 90 STEPS AT 23 CM = 20.7 M – TOTAL HEIGHT
 - 6.25% – LADDER SLOPE
 - 0.75 M X 0.75 M – ORIFICE SIZE
 - 2.5 M – WEIR LENGTH
 - 1.5 CMS – TOTAL LADDER FLOW
 - 2.50 M – POOL DEPTH, MINIMUM
 3. INTENT OF THIS DRAWING IS TO ILLUSTRATE THE GENERAL CONCEPT FOR THIS ALTERNATIVE, WITH REASONABLE ASSUMPTIONS FOR THE POOLS, SLOPE, AND RESULTING LENGTH. ADDITIONAL RESEARCH FOR STURGEON PASSAGE IS RECOMMENDED.
 4. LOCATION SHOWN IS APPROXIMATE TO ILLUSTRATE LENGTH AND EXIT LOCATION. ADDITIONAL ANALYSIS IS NECESSARY TO OPTIMIZE LADDER TO THE SITE.
 5. FISH LIFT, OR A LONGER ENTRANCE TRANSITION, AT FISH COLLECTION FACILITY WILL BE REQUIRED.



PHOTO 1
THE DALLES DAM, EAST BANK
ICE HARBOR STYLE
FISHLADDER, SHOWN
DEWATERED



PHOTO 2
RIVER MILL DAM HALF-ICE
HARBOR STYLE FISHWAY



PHOTO 3
RIVER MILL DAM FISHWAY EXIT SECTION (TO
RESERVOIR) SHOWING ADJUSTABLE CONTROL
WEIRS TO ACCOMMODATE VARYING POOL
ELEVATION



PHOTO 4
LOWER MONUMENTAL SOUTH
LADDER SHOWING FISHWAY
ASCENDING DAM

DRAFT FOR REVIEW AND
DISCUSSION ONLY

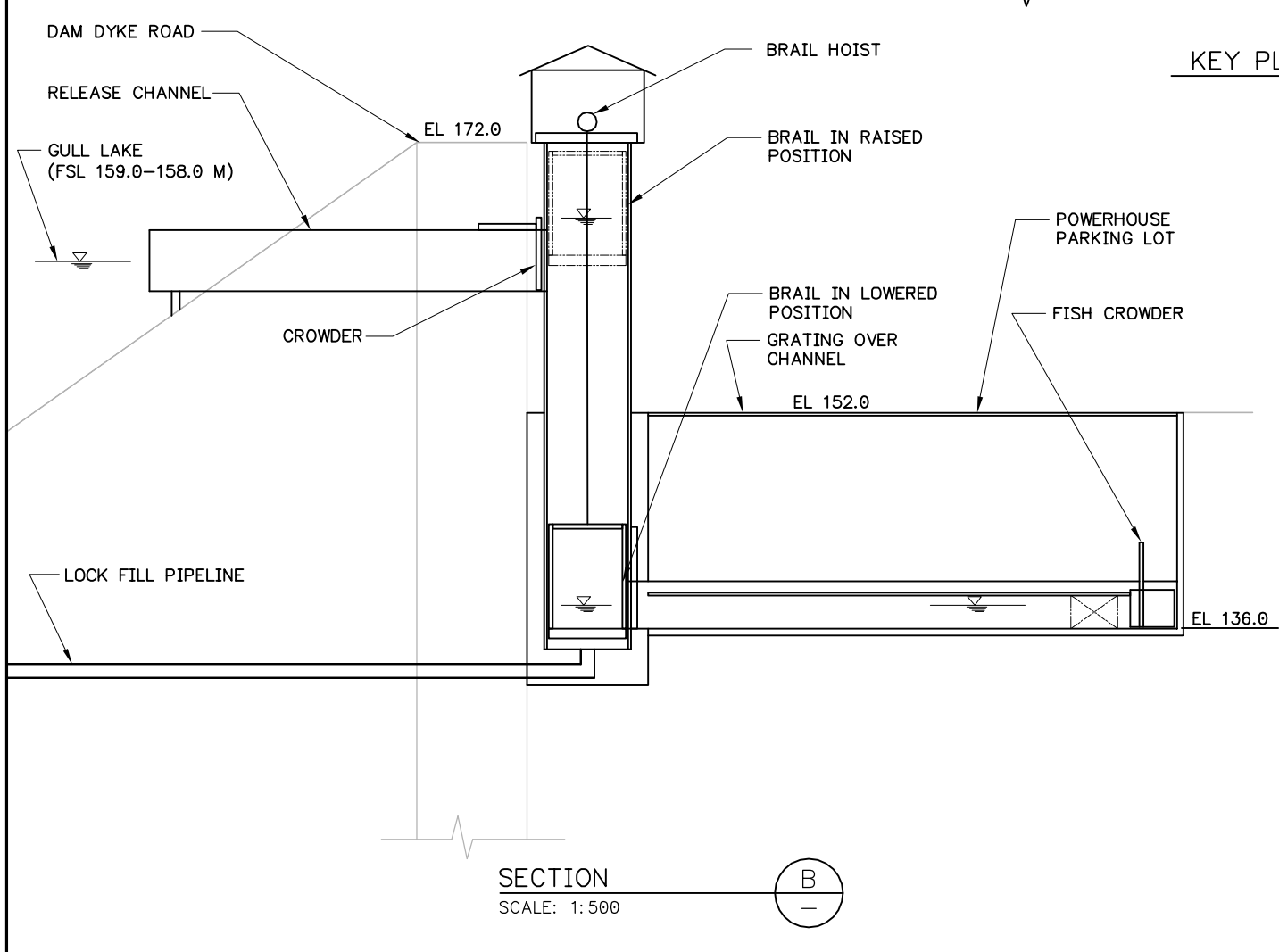
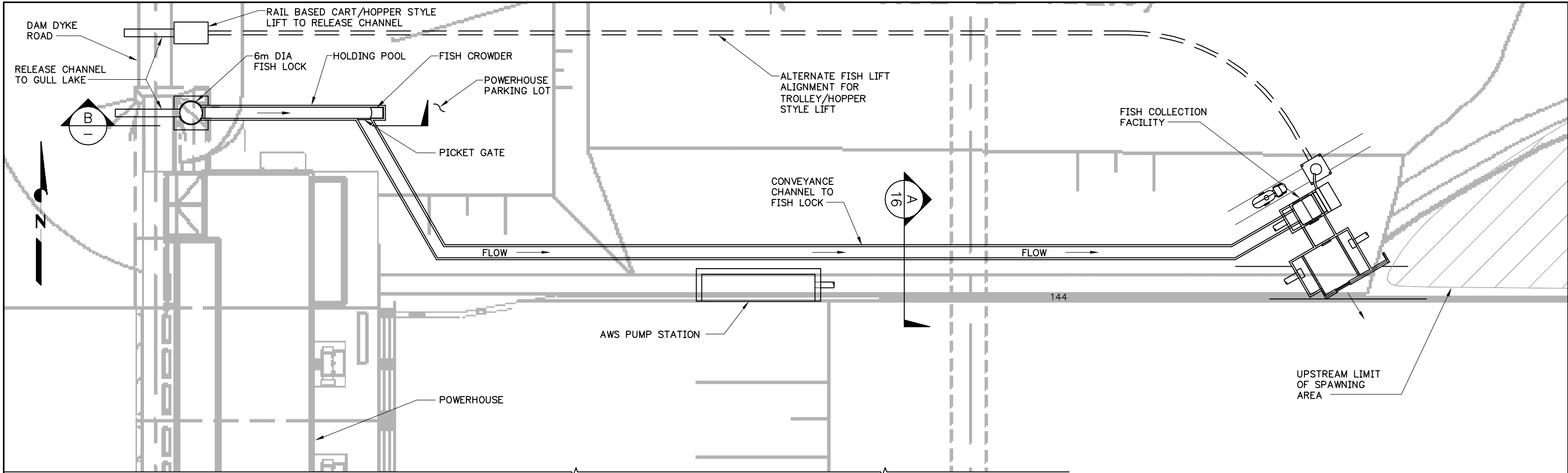
Resource
Consultants, Inc.
REDMOND, WA.

DATE: 3/16/2012

MANITOBA HYDRO
KEEYASK FISH PASSAGE FACILITIES STUDY
UPSTREAM PASSAGE – ALT UP-4
CONCRETE FISHWAY – PLAN & DETAILS
SHEET 1 OF 1

DWG 14

\\manitoba\project\1895\Keyask FP Study\Drawings\UPSTREAM PASSAGE PACKAGES\WORKING DRAWINGS\DWG 15 Upstream Passage Alt UP-5 - Sheet 1 of 1.dwg, 3/19/2012 10:02:04 AM



KEY PLAN ALT UP-5 LIFT OR LOCK
SCALE: 1:1000

UPSTREAM PASSAGE
ALT UP-5: LIFT OR LOCK

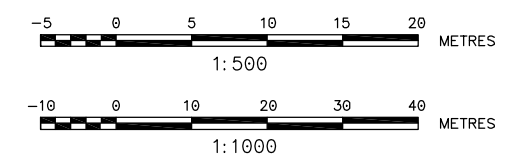
NOTES:

1. LOCK STYLE LIFT SHOWN. HOPPER STYLE LIFT WOULD BE SIMILAR BUT NOT ILLUSTRATED.
2. FISH LIFT IN COLLECTION FACILITY WOULD BE USED TO LIFT FISH TO CONVEYANCE CHANNEL.
3. ALTERNATE LIFT STYLE SHOWN IN DASHED LINES.



FISH LOCK AND FISH TRUCK LOADING
REF: BAKER ADULT FISH TRAP

CIRCULAR LOCK
FISH TRUCK SHOWN
IN LOADING POSITION



DISTANCES AND ELEVATIONS ARE IN METRES

DRAFT FOR REVIEW AND
DISCUSSION ONLY

Resource
Consultants, Inc.
REDMOND, WA.

DATE: 3/16/2012

MANITOBA HYDRO
KEEYASK FISH PASSAGE FACILITIES STUDY

UPSTREAM PASSAGE - ALT UP-5
LIFT OR LOCK - PLAN & DETAILS
SHEET 1 OF 1

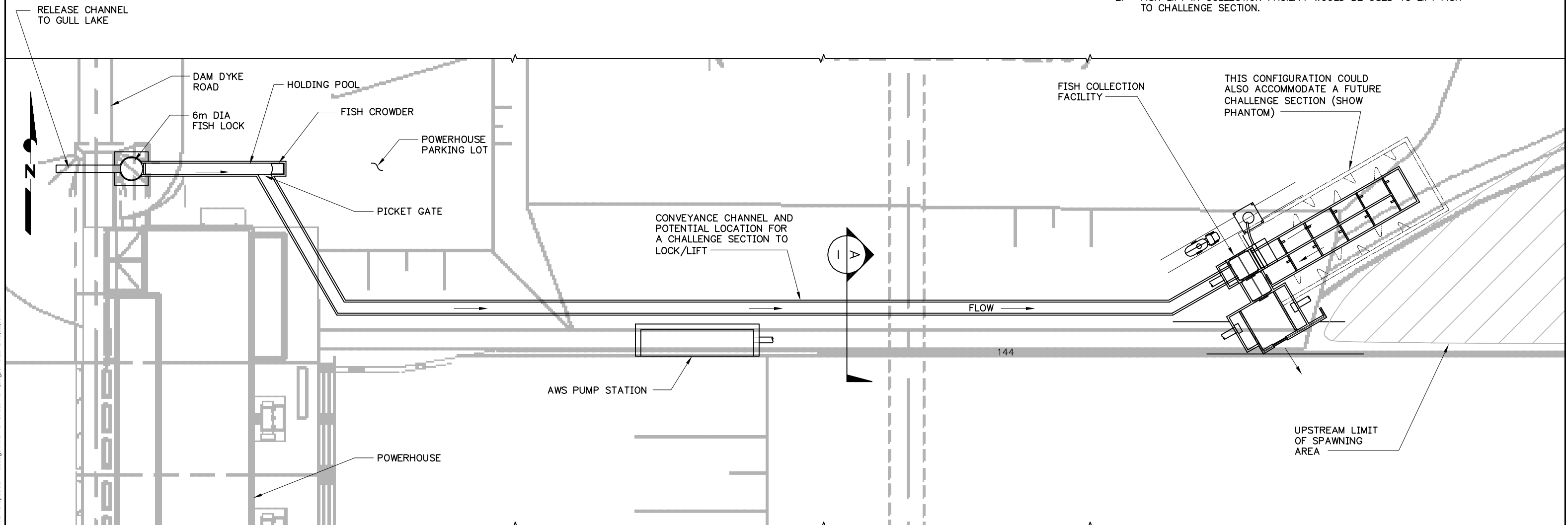
DWG 15

UPSTREAM PASSAGE

ALT UP-6: LIFT OR LOCK WITH CHALLENGE

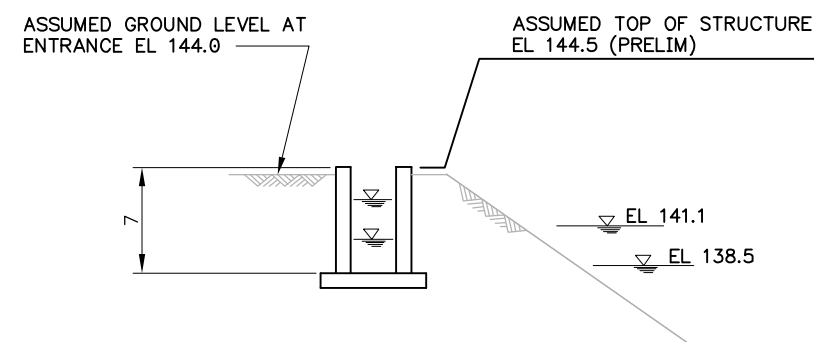
NOTES:

1. LOCK STYLE LIFT SHOWN WITH CHALLENGE SECTION. HOPPER STYLE LIFT WOULD BE SIMILAR BUT NOT ILLUSTRATED.
2. FISH LIFT IN COLLECTION FACILITY WOULD BE USED TO LIFT FISH TO CHALLENGE SECTION.



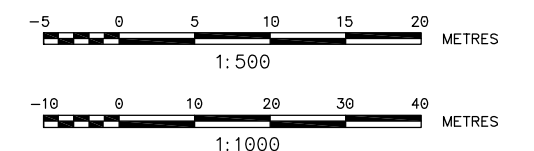
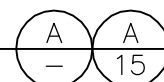
KEY PLAN ALT UP-6 LIFT OR LOCK WITH CHALLENGE

SCALE: 1:1000



SCHEMATIC CONCEPT OF CONVEYANCE CHANNEL

SCALE: 1:500



DISTANCES AND ELEVATIONS ARE IN METRES

DRAFT FOR REVIEW AND DISCUSSION ONLY

Resource
Consultants, Inc.
REDMOND, WA.

DATE: 3/16/2012

MANITOBA HYDRO
KEEYASK FISH PASSAGE FACILITIES STUDY

UPSTREAM PASSAGE – ALT UP-6
LIFT OR LOCK WITH CHALLENGE – PLAN
SHEET 1 OF 1

DWG 16