

PROJECT MEXICUS XL 1900 MEGATON CLASS - TRANSOCEANIC (transoceanic.us) COSTS

(Interactive file - inputs in green cells) Rev 5

SUMMARY

Source rivers (multiple; chose one or more): Pacific Mexican Rivers discharging between Yaqui and San Lorenzo Rivers

Deliveries place (with partial price of pipeline canals included): Direct Lower Colorado River Basin via Wagner Basin with possible routes to El Golfo de Santa Clara, San Felipe, Puerto Peñasco, Mexico, to AZ, CA, and NW Mexico.

| | |
|---|----------------|
| Average rivers' flow (mil cubic meter per year) | 16,538 |
| Average rivers' flow (cubic meter per second) | 524 |
| Required flow (cubic meter per second) | 59 |
| Delivered water (cubic meter per year) | 1,850,220,000 |
| Delivered water, AFY | 1,500,000 |
| Delivered water cost with water price-at-source included (US\$ per cubic meter) | 0.0485 |
| Delivered water cost with water price-at-source included (US\$ per AF) | 60 |
| CAPEX (US\$) | \$ 833,395,097 |

The water price-at-source can be covered by deliveries of water to Mexico's points of landing and their surroundings.

PROJECT PRESENTATION

Supply station(s) Pacific Mexican Rivers discharging between Yaqui and San Lorenzo Rivers

Delivery station Direct Lower Colorado River Basin via Wagner Basin with possible routes to El Golfo de Santa Clara, San Felipe, Puerto Peñasco, Mexico, to AZ, CA, and NW Mexico.

Distance, one way, km 800

CONSTANTS AND TRANSFORMATIONS

| | |
|---------------------------------------|---------|
| cubic meters for one acre ft | 1233.48 |
| meters for one ft | 0.3048 |
| Sea water density is (kg/cubic meter) | 1028 |
| Pi value | 3.14159 |
| Kilometers in one mile | 1.60934 |

SUBMERSIBLE TRANSPORTER GEOMETRY

Radius, meters 50

| | |
|----------------------------------|-----|
| Radius, ft | 164 |
| L/(2R) RATIO | 7 |
| Equivalent submersible length, m | 700 |

| | |
|--|-----------|
| Submersible Section, square meters | 7854 |
| Submersible surface (cylinder, considered closed by hemispheres) | 251327 |
| volume (cylindrical length), cubic meters | 5,497,783 |
| volume, acre-ft | 4457.13 |

STRUCTURE

| | |
|---|--------|
| Relative density of concrete | 2.4 |
| ballasting required (on cylindrical part), kg/square meters | 700 |
| thickness of concrete wall, m | 0.510 |
| Volume of concrete required, cubic meters | 128228 |
| Volume of concrete required, cubic yards | 167716 |
| Weight of concrete structure, metric tonnes | 307748 |
| Chamber thickness, meters | 0.7 |
| Total hull thickness, meters | 1.21 |

STRESSES

| | |
|--|-----------|
| Max tangent force, Newton/linear meter | 1,030,050 |
| Max tangent force, metric tonne force/linear meter | 105.00 |

HYDRODYNAMICS

| | |
|---------------------------------|-----------|
| cx (drag coefficient) | 0.08 |
| speed v, m/s | 3 |
| speed km/h | 10.8 |
| Drag force, Newton | 2,906,599 |
| Drag force, metric tonne force | 296.29 |
| Power required for cruising (w) | 8,719,797 |
| Power for cruising, Mw | 8.720 |

POWER AND ENGINE

| | |
|-------------------------|-----|
| Hydrodynamic efficiency | 0.7 |
|-------------------------|-----|

| | |
|------------------------------|--------|
| Required Engine power, Mw | 12.457 |
| Engine reserve, % | 20% |
| Total Engine Installed Power | 14.948 |

FIXED COSTS

SUBMERSIBLE COST

| | |
|--|---------------|
| Unit Concrete price, \$/cubic meter | 70.00 |
| Unit cost of armature, \$/cubic meter | 60.00 |
| Unit cost of work, \$/cubic meter | 120.00 |
| Total unit price of concrete, \$/cubic meter | 250.00 |
| Cost of concrete for submersible, \$ | \$ 32,057,041 |

PROPULSOR COSTS

| | |
|--------------------------|--------------|
| Cost of propulsion \$/Mw | 500,000 |
| Total cost of propulsion | \$ 7,474,112 |

INSTRUMENTATION, COMMAND AND CONTROL (ICC) +OTHER ITEMS

| | |
|--|---------------|
| Cost of ICC, BAGS OTHER STRUCTURES (AT 50% OF CONCRETE COST) | \$ 16,028,520 |
|--|---------------|

| | |
|--------------------------------------|----------------------|
| Complexity Factor | 1.50 |
| Total cost of one submersible | \$ 83,339,510 |

COST OF FIRST ARTICLE (1 X BOAT +

| | |
|--|----------------|
| LOAD/UNLOAD STATIONS at 150% over average costs) | \$ 375,027,794 |
|--|----------------|

VARIABLE COSTS (FUEL)

FUEL COST PER HOUR

| | |
|---|--------|
| Fuel Consumption, kg/kWh | 0.165 |
| Fuel cost (LNG), \$/kg | 0.2000 |
| Cost of fuel per hour (at required power) \$/hour | 411 |

TRIP COMPUTATION

| | |
|--------------------------|--|
| Supply station | Pacific Mexican Rivers discharging between Yaqui and San Lorenzo Rivers |
| Delivery station | Direct Lower Colorado River Basin via Wagner Basin with possible routes to El Golfo de Santa Clara, San Felipe, Puerto Peñasco, Mexico, to AZ, CA, and NW Mexico. |
| Distance, one way, km | 800 |
| Distance, one way, miles | 497 |

| | | |
|--|----|---------|
| Stationing, days at each station | | 1.1 |
| Cruise time, round trip, hours | | 148.15 |
| Cruise time, round trip, days | | 6.17 |
| Total travel time, hours | | 201 |
| Total travel time, days | | 8.37 |
| Fuel cost per trip (stationary at half consumption per hour), \$ | \$ | 71,753 |
| Submersible life (years) | | 30 |
| Amortization of submersible (30 year life) \$/hour | | 396.40 |
| Cost of submersible per trip | \$ | 79,656 |
| Net cost per trip (submersible+fuel) | \$ | 151,409 |
| Net transport cost \$/acre-ft | | 33.97 |
| Cost of O+M/R+R and other costs (% of net cost) | | 33% |
| Brut cost per trip, \$ | | 177695 |
| Brut transport cost \$/acre-ft | | 39.87 |
| Brut transport cost \$/cu meter | | 0.0323 |

TRANSPORTATION SYSTEM CONFIGURATION AND COST

| | | |
|--|----|---------------|
| Transported water, cubic meter / year | | 1,850,220,000 |
| Transported water, acre-ft per year | | 1,500,000 |
| Transporter capability per boat, trips/year | | 43.593 |
| Transporter capability per boat, mil cubic m/year | | 239.67 |
| Transporter capability per boat, acre-ft/year | | 194,301 |
| Required number of transporters | | 8 |
| Cost of transporters (boats) | \$ | 666,716,077 |
| Cost of two terminal stations (each equal to one submersible transporter cost) | \$ | 166,679,019 |
| Total cost of transportation system | \$ | 833,395,097 |

PARAMETERS

| | | |
|---|--|-----------|
| Transportation pressure drop equivalent, meters | | 86 |
| Transportation pressure drop equivalent, ft | | 283 |
| Water flow at stations for continuous filling/emptying, cubic m/sec | | 58.67 |
| Transportation system capability (acre-ft/yr) | | 1,554,410 |

| | | |
|--|----|-------------------|
| Cost of O+M/R+R and other costs, \$ | \$ | 16,815,153 |
| Unit cost of water at purchase (\$/cubic meter) | | 0 |
| Total cost of water, \$/year | | - |
| Markup (water) | | 0% |
| Water sale markup, \$/year (includes G&A) | | - |
| | | |
| The total cost of water transportation, \$/year | | 59,801,467 |
| Unit cost of water at transportation, \$ / cubic meter | | 0.0323 |
| Unit cost of water, delivered, \$ / acre-ft | | 39.87 |
| Price for transported water with exchanged and water rights included (+50%) \$ / cubic meter | | 0.0485 |
| Cost for transported water with exchanged and water rights included (+50%) \$/AF | | 59.80 |

6

0.025

1,917,333,407.40