Solutions to end-of-chapter problems

Chapter 5

5.11 $PW_A = -952{,}000 - 1{,}300{,}000 - 126{,}000(P/A,6\%,50)$
$= -952{,}000 - 1{,}300{,}000 - 126{,}000(15.7619)$
$= \$-4{,}238{,}000$

$PW_B = -5(366{,}000) - 9000(151.18) - 340{,}000 - 81{,}500 + 500{,}000(P/F,6\%,5)$
$= -3{,}612{,}120 + 500{,}000(0.7473)$
$= \$-3{,}238{,}470$

Select Plan B

5.12 $PW_{No\ drains} = -1500(P/A,4\%,12)$
$= -1500(9.3851)$
$= \$-14{,}078$

$PW_{Corrugated} = -3(7000) + 4000(P/F,4\%,12)$
$= -21{,}000 + 4000(0.6246)$
$= \$-18{,}502$

Do not install corrugated pipe

5.15 $PW_{Volt} = -35{,}000 + 15{,}000(P/F,0.75\%,60)$
$= -35{,}000 + 15{,}000(0.6387)$
$= \$-25{,}420$

$PW_{Leaf} = -1500 - 349(P/A,0.75\%,60)$
$= -1500 - 349(48.1734)$
$= \$-18{,}313$

Select the Nissan Leaf

5.18 $PW_A = -5{,}000{,}000 - 5{,}500{,}000(P/A,10\%,10)$
$= -5{,}000{,}000 - 5{,}500{,}000(6.1446)$
$= \$-38{,}795{,}300$

$PW_B = -5{,}000{,}000 - 25{,}000{,}000(P/F,10\%,2) - 30{,}000{,}000(P/F,10\%,7)$
$= -5{,}000{,}000 - 25{,}000{,}000(0.8264) - 30{,}000{,}000(0.5132)$
$= \$-41{,}056{,}000$

Select Plan A

5.20 Set the PW_S relation equal to \$-33.16, and solve for the first cost X_S (a positive number) with repurchase in year 5. In \$1 million units,

$$-33.16 = -X_S[1 + (P/F,12\%,5)] - 1.94(P/A,12\%,10) + 0.05X_S[(P/F,12\%,5) + (P/F,12\%,10)]$$
$$= -1.5674X_S - 1.94(5.6502) + 0.0445X_S$$

$$1.5229X_S = -10.9614 + 33.16$$

$$X_S = \$14.576 \qquad (\$14{,}576{,}000)$$

Select seawater option for any first cost $\leq$ \$14.576 million

5.21 $PW_1 = -26{,}000 - 5000(P/A,10\%,6) - 26{,}000(P/F,10\%,3)$
$= -26{,}000 - 5000(4.3553) - 26{,}000(0.7513)$
$= \$-67{,}310$

$PW_2 = -83{,}000 - 1400(P/A,10\%,6) - 2500(P/F,10\%,3)$
$= -83{,}000 - 1400(4.3553) - 2500(0.7513)$
$= \$-90{,}976$

Select Plan 1

5.25 (a) Use LCM of 12 years and select L.

(b) Use PW over life of each alternative and select I, J and L with PW > 0.

5.30 $FW_{Old} = -1{,}300{,}000(F/P,10\%,5) - 100{,}000{,}000(F/P,10\%,4)$
$= -1{,}300{,}000(1.6105) - 100{,}000{,}000(1.4641)$
$= \$-148{,}503{,}650$

$FW_{New} = -1{,}300{,}000(F/P,10\%,6) - 100{,}000{,}000$
$= -1{,}300{,}000(1.7716) - 100{,}000{,}000$
$= \$-102{,}303{,}080$

Difference = 148,503,650 - 102,303,080
= \$46,200,570 (higher cost for old contract)

5.34 Use C to identify the contractor option.

(a) CC_C = -5 million/0.12 = $-41.67 million

Between the three options, select the contractor

(b) Find P_g and A of the geometric gradient (g = 2%), then CC.

P_g = -5,000,000[1 - (1.02/1.12)^{50}]/(0.12 – 0.02)
= -5,000,000[9.9069]
= $-49.53 million

A = P_g(A/P,12%,50)
= -49.53 million(0.12042)
= $-5.96 million per year

CC_C = A/i = -5.96 million/0.12
= $-49.70 million

Now, select groundwater (CC_G = $-48.91) source by a relatively small margin.

5.37 CC = (-40,000/0.08)(P/F,8%,11)
= (-40,000/0.08)(0.4289)
= $-214,450

5.47 Answer is (b)