

## SANDBAG COST ESTIMATES

Solution Type	Usage 1	Usage 2	Usage 3
<b>SANDBAGS</b>			
<i>Materials - Response</i>	\$11,105	\$11,105	\$11,105
<i>Labor: Response</i>	\$9,100	\$9,100	\$9,100
<i>Materials – Recovery</i>	\$16,713	\$16,713	\$16,713
<i>Labor: Recovery</i>	\$6,825	\$6,825	\$6,825
<i>Total</i>	<b>\$43,743</b>	<b>\$87,486</b>	<b>\$131,229</b>
<b>PORTADAM</b>			
<i>Material</i>	<b>\$30,000</b>	-----	-----
<i>Labor: Recovery</i>	<b>\$80</b>	<b>\$80</b>	<b>\$80</b>
<i>Labor: Response</i>	<b>\$80</b>	<b>\$80</b>	<b>\$80</b>
<i>Total</i>	<b>\$30,080</b>	<b>\$0</b>	<b>\$0</b>
<b>Aggregate Total</b>	<b>\$30,080</b>	<b>\$30,320</b>	<b>\$30,480</b>

- HOW MANY SANDBAGS ARE REQUIRED FOR 150 LINEAR FT. WITH A DIKE HEIGHT OF 4FT.?

11,700 sandbags are needed for a 4 ft dike

[https://www.spa.usace.army.mil/Portals/16/docs/emergencymgmt/SPA\\_Flood\\_Emergency\\_Handbook.pdf?ver=ZJPIdpwN0LFs-aXK4zR5uw%3D%3D](https://www.spa.usace.army.mil/Portals/16/docs/emergencymgmt/SPA_Flood_Emergency_Handbook.pdf?ver=ZJPIdpwN0LFs-aXK4zR5uw%3D%3D)

[see calculations below]

- HOW MUCH LABOR IS NEEDED FOR 150 LINEAR FT. WITH A DIKE HEIGHT OF 4 FT.?

11,700 sandbags require 455 man-hours

[https://www.co.delaware.in.us/egov/docs/1275669099\\_402038.pdf](https://www.co.delaware.in.us/egov/docs/1275669099_402038.pdf)

[see calculations below]

- WHAT ARE THE ESTIMATED TOTAL COSTS FOR 150 LINEAR FT. WITH A 4 FT. HIGH DIKE?

### RESPONSE

Material Costs	
Sandbags	\$2,925
Sand Fills	\$928
Equipment Rentals	\$6,800



Hand Tools	\$452
Material Costs Subtotal	\$11,105
Labor	\$9,100
Response Subtotal	\$20,205

### RECOVERY

Material Costs	
Equipment	\$10,000
Transport	\$5,460
Dump Fees	\$1,253
Material Costs Subtotal	\$16,713
Labor	\$6,825
Recovery Subtotal	\$23,538
<b>TOTAL COSTS</b>	<b>\$43,743</b>

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### ASSUMPTIONS:

- Sandbag Cost.....\$0.25 each
- Sand Cost.....\$20 per cy
- Laborer.....\$20 per hour
- Trucking.....\$70 per truck per hr
- Dump Fee.....\$27 per cy
- Labor Recovery.....75% of labor response time
- Response Equipment Rentals.....\$6,800
- Recovery Equipment Rentals.....\$10,000

## CALCULATIONS

### Laborers:

To calculate the number of laborers, we created a proportion using the numbers found on page 8 in the hyperlinked document below. Based on this document, we know that 28 laborers can construct 1,800 sandbags in 2.5 hours or 150 minutes. By multiplying laborers by minutes, we arrive a total of 4,200 man-minutes needed for 1,800 sandbags.

To then calculate the man-hours necessary for 11,700 sandbags, we created a proportion with ratios between number of sandbags and man-minutes. Because 1,800 sandbags take 4,200 man-minutes to erect, we then found that 11,700 sandbags require 27,300 man- minutes to construct. To convert this to man-hours we divided 27,300 by 60 minutes, yielding 455 man-hours.



[https://www.co.delaware.in.us/egov/docs/1275669099\\_402038.pdf](https://www.co.delaware.in.us/egov/docs/1275669099_402038.pdf)

Man-minutes for 1,800 sandbags

28 people \* 150 minutes= 4,200 man-minutes

1,800 sandbags: 4,200 man-minutes=11,700: 27,300 minutes→ 27,300 sandbags/60 minutes= [455 man-hours](#)

## RESPONSE:

### Sandbags

It is widely accepted that sandbags cost \$.25 each. The cost of sandbags can be calculated by multiplying \$.25 by 11,700 sandbags, totaling \$2,925.

\$.25 per sandbag \* 11,700 sandbags= [\\$2,925 sandbag total cost](#)

### Sand fills:

We consulted page 8 of the document again to identify the amount of sand needed for 1,800 sandbags and then arranged a proportion with ratios between sandbags and amount of sand needed, using 1,800 sandbags as our frame of reference. This resulted in 65 tons of sand required for 11,700 sandbags.

Because we know that sand costs \$20 per cy, we needed to convert 65 tons to cubic yards, which can be achieved by dividing tons by 1.4 tons, as there are 1.4 tons in a cubic yard. This gave us \$928 for the cost of sand.

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1,800 sandbags: 10 tons=11,700 sandbags: [65 tons of sand](#)

65 Tons converted to cubic yards=

65 tons/1.4 tons=46.43 cubic yards

Sand costs \$20/cy→ \$20 \* 46.43= [\\$928 cost of sand](#)

### Labor:

Our assumption is that labor costs \$20 per hour, therefore multiplying the number of man-hours by \$20 gives us a total cost of \$9,100 for labor.

\$20 per hour \* 455 man-hours= [\\$9,100 labor response cost](#)

## RECOVERY:

### Transport:

Transport costs were calculated with another proportion using page 8 of the document. We created an equivalence between the number of sandbags and the number of pickup trucks. Because 6 pickup trucks are needed for 1,800 sandbags, we need 39 pickup trucks for 11,700 sandbags.

At \$70 per truck per hour, we arrived at \$2,730 for the cost of all 39 trucks. We then multiplied this total by 2 because we are assuming 2 hours of truck time will be needed.

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1,800 sandbags: 6 pickup trucks: 11,700 sandbags: 39 pickup trucks

\$70 per truck per hour

\$70 per truck per hour \* 39 pickup trucks = \$2,730 transport cost for one hour

Assuming 2 hours of truck time:

\$2,730 \* 2 = \$5,460 total transport cost

### Dump Fees:

Earlier, we found that the amount of sand in cy required for 11,700 sandbags is 46.43. We know that dump fees are \$27/cy, so we multiplied 46.43 cy by \$27 yielding \$1,253 in total dump fees.

\$27/cy

46.43 cy \* \$27/cy = \$1,253 total dump fees

### Labor:

We assume that labor recovery time is 75% that of labor response time. Labor response time is \$9,100, so 75% of that is \$6,825.

\$9,100 labor response time \* .75 = \$6,825 labor recovery cost