The fundamental linearized fluid dynamic equations are

\[
\frac{\partial h(\vec{x},t)}{\partial t} = (-\Delta)^{1/2} \phi(\vec{x},t) \tag{1}
\]

\[
\frac{\partial \phi(\vec{x},t)}{\partial t} = -gh(\vec{x},t) + S(\vec{x} - \vec{u}t) \tag{2}
\]

with the definitions:

- \( h \) is the waveheight,
- \( \phi \) is the velocity potential,
- \( \vec{x} \) is the position on the water surface,
- \( t \) is time,
- \( S \) is the shape of the wake source,
- \( \vec{u} \) is the source velocity,
- \( g \) is the gravitational constant

We solve this by taking the FFT in space and time, to get

\[
\hat{h}(\vec{k},\omega) = \frac{1}{g} \frac{\hat{S}(\vec{k})}{1 - \omega^2 / (gk)} \delta(\omega - \vec{u} \cdot \vec{k}) \tag{3}
\]

Now doing the temporal frequency integral, we have

\[
\tilde{h}(\vec{k},t) = \exp(-i\vec{k} \cdot \vec{u}t) \frac{1}{g} \frac{\hat{S}(\vec{k})}{1 - (\vec{u} \cdot \vec{k})^2 / gk} \tag{4}
\]

Now all that needs to be done is build the source shape in Fourier space, and apply it here in the inverse FFT. Just be careful of the pole.