

# Harmful Contaminant Removal

## GAC Contactors and Horizontal Pressure Filters



CASE STUDY

**Location:** Santa Monica, CA  
**Owner:** City of Santa Monica  
**Engineer:** Black & Veatch  
**Contractor:** Black & Veatch Construction

### Expanding Service

The City of Santa Monica shut down the Charnock Well Field in 1996 after finding methyl tertiary-butyl ether (MTBE) and, later, trichloroethylene (TCE) and 1,1-Dichloroethene (1,1-DCE) in the water. These potential carcinogens spread rapidly through the environment, resulting in the shutdown of all five Charnock wells. Approximately 50% of the city's residential water was supplied through these wells.

Removal of these contaminants is typically difficult and costly. As a result, the city purchased approximately 85% of its domestic water from the Metropolitan Water District. Following the goal of self-sustainability, and with the rising cost of purchasing water, the city opted to treat the polluted groundwater supply. Black & Veatch Contractors were hired to rehabilitate the Charnock wells through an extensive design-build project.

### Equipment Selection

To remove contaminants, WesTech supplied nine horizontal pressure filters (12 ft. diameter x 38 ft. long) and ten Granular Activated Carbon (GAC) contactor vessels (12 ft. diameter). Each GAC vessel contains

20,000 lbs. of Calgon Carbon coconut-based activated carbon.

Horizontal Pressure Filter	
Quantity	9
Filter Area / unit	459 ft <sup>2</sup>
Cells / unit	2
Design Filtration Rate	3.3 gpm/ft <sup>2</sup>
Minimum Backwash Rate	11 gpm/ft <sup>2</sup>
Backwash Flow	2,522 gpm/cell

WesTech's dual-media horizontal pressure filters are an effective way to remove iron and manganese. If iron and manganese are not removed, GAC and reverse osmosis (RO) membranes will foul

Pressure Filter Media	
<b>Anthracite Coal Media</b>	
Depth	18 in
Effective Size	0.6-0.8 mm
<b>Greensand Plus™ Media</b>	
Depth	18 in
Effective Size	0.3-0.35 mm
<b>Support Gravel Media</b>	
Depth	12 in
Total Media Depth	48 in

prematurely and require replacement. Greensand Plus™ media was installed in the pressure filters for the removal of dissolved manganese and to reduce contact times. The filter media depth was customized to match the water quality and remove the damaging contaminants.

GAC Contactors	
Design Flow per Train	750 gpm
Empty Bed Contact Time	6 min
Design Loading Rate	6.6 gpm/ft <sup>2</sup>
Backwash Flow Rate	12 gpm/ft <sup>2</sup>

Through a lead/lag configuration, GAC contactors were able to remove MTBE, TCE, and 1,1-DCE while providing redundancy. The lead/lag configuration consists of two vessels in series. After the GAC in the primary vessel needs replacement, flow is diverted to run through the secondary vessel first. By using the lead/lag configuration, WesTech has lengthened the usable life of the GAC.

Following the GAC contactors, water is sent to the Arcadia Water Treatment Plant where RO membrane softening is used to reduce the levels of hardness from 500 mg/L as CaCO<sub>3</sub> to 120 mg/L as CaCO<sub>3</sub>. In addition, RO membranes act as a second barrier for MTBE removal.

## Superior Service

As a result of extensive experience in pressure filter and contactor design, WesTech customized vessel quantity, diameter, and media type to remove harmful contaminants. One of the complexities of the Charnock Well Field project was fabricating and shipping a significant number of large-diameter vessels while meeting strict project deadlines. WesTech's expertise in design, fabrication, and delivery scheduling allowed the project to run smoothly and be completed on time.

WesTech's dual-media horizontal pressure filters and GAC contactors reduced high concentrations of contaminants to a non-detectable level. With the complete removal of these harmful contaminants in the Charnock well fields, the City of Santa Monica eliminated the need for imported water and has met the goal of self-sustainability.



Horizontal Pressure Filters at Bundy Well Site

Contaminant	Maximum Allowed Contaminant Level (µg/L)	Contaminant Level Prior to Treatment (µg/L)	Contaminant Level After Treatment (µg/L)
MTBE	5.0	610.0	Non-Detect
TCE	2.5	35.0	Non-Detect
1,1-DCE	3.0	12.0	Non-Detect



Vertical Pressure Filters at Westminster Well Site



**Granular Activated Carbon:** Commonly used for adsorption applications, e.g., taste, odor, TOC, SOC removal.



## GAC Adsorption

